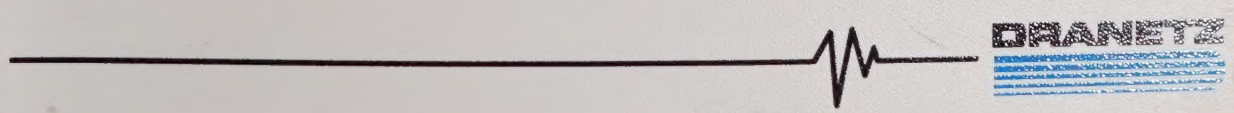
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TM-115090-G1
OPERATOR'S GUIDE

DRANETZ 658
GRAPHICAL AND HARMONIC
ANALYSIS SOFTWARE
658-OS-2001

Version 5.0

April 1, 1992

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Dranetz Technologies, Inc.
1000 New Durham Road
Edison, New Jersey 08818

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Page No.	Change No. *	Page No.	Change No. *
Title	0	A-1/A-2	0
ii thru viii	0		
ix/x	0	B-1/B-2	0
1-1 and 1-2	0	C-1 and C-2	0
2-1 thru 2-6	0	D-1 thru D-10	0
		D-11/D-12	0
3-1 thru 3-8	0		
3-9/3-10	0		
4-1 thru 4-18	0		
5-1 thru 5-30	0		

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Table of Contents

Chapter 1 - Introduction

General Information 1-1

What's In This Manual 1-1

Included In This Package 1-2

Terminology 1-2

Conventions Used In This Manual 1-2
- Text-On-Screen and Field Names 1-2
- Computer Command Keys 1-2
- Options 1-3
- Entering Text 1-3

Chapter 2 - Getting Started

General Information 2-1

What You Must Already Know 2-1

Required Equipment 2-1

Optional Equipment 2-1

Configuring Your Personal Computer 2-2

Installing the Program 2-2

Running the Program 2-2
- Monochrome Operation 2-2

Main Menu Description 2-3
- Locations 2-3
- Summaries 2-3
- Events 2-3
- Disk 2-3
- Communications 2-4
- Exit 2-4
- Help=F1 2-4

Pull-Down Menus 2-4

Selecting Menu Options 2-4
- Keyboard 2-4
- Mouse 2-5

Dialog Boxes 2-5
- Example Dialog Box 2-5
- Selecting Items with the Keyboard 2-6
- Selecting Items with the Mouse 2-6

Table of Contents (Continued)

Chapter 3 - Disk Functions And Data Base Management

General Information 3-1

Disk Functions 3-1
- Read 658 Data Disk 3-1
- Disk Free Space 3-4

Data Base Management 3-4
- Selecting Active Location File 3-5
- Backup Location File 3-6
  - Backing Up Multiple Location Files Onto One Floppy Disk 3-6
- Restore Location File 3-7
- Rename Location File 3-8
- Delete Location File 3-8
- Location File Size 3-9

Chapter 4 - Communications

General Information 4-1

Direct Serial Connection 4-1

Modem Connection 4-1
- Internal Modem 4-1
- External Modem 4-2
- Connection to the PC 4-2

Change Parameters 4-4
- Modem Connect Parameters 4-4
- Direct Connect Parameters 4-5
- Once Parameters are Set 4-6

Establishing the Connection 4-6
- If the Connection is Unsuccessful 4-7
- If the Connection is Successful 4-8

Status Box 4-8

Communications Menu 4-9
- Transfer Events from Memory 4-9
- Delete All Events in Memory 4-10
- Change Auto-Transfer to Disk 4-11
- Activating a Main Channel Setup 4-11
- Changing a Main Channel Setup 4-12
- Activating a Sensor Channel Setup 4-14
- Changing a Sensor Channel Setup 4-14

Special 657 Operation 4-15
- Transfer Events From Disk 4-15
- Changing a 657's Site ID 4-16
- Changing a 657's Clock 4-16

Disconnecting the Link 4-17

Table of Contents (Continued)

Creating a Location File 4-18

Printer Setup 4-19

Chapter 5 - Data Analysis

General Information 5-1

Graphics Screen 5-1
- Types of Graphics Screens 5-1
- Selecting Menu Options with the Keyboard 5-2
- Selecting Menu Options with the Mouse 5-2

Viewing Graphic Summaries 5-3
- Types of Summaries 5-3
  - RMS/Impulse Summaries 5-3
  - Frequency Summaries 5-4
  - Sensor Channel Summaries 5-4
- Menu Options 5-5
  - View 1:st ev 5-5
  - Next channel 5-5
  - Setup 5-6
  - Print 5-6
  - Zoom 5-7
  - Exit 5-8
  - Help 5-8

Viewing Events 5-8
- View by Number 5-9
- View by Date and Time 5-10
- Event Types 5-10
  - Initial Events 5-11
  - Sensor Channel Events 5-12
  - Waveform Events 5-13
  - Out-of-Limits Events 5-13
  - Frequency Events 5-15
  - Power ON/OFF Events 5-15
  - Pseudo RMS Event 5-16
- Menu Options 5-16
  - Forward 5-16
  - Reverse 5-16
  - Ev # 5-17
  - Setup 5-17
  - Print 5-18
  - T.h.d. 5-18
  - Zoom 5-18
  - Exit 5-22
  - Help 5-23

Harmonic Analysis 5-23
- Selecting Cycle 5-23
- Analyzing Cycle 5-25
- Selecting with Zoom 5-26
- Changing Default Frequency 5-29

Table of Contents (Continued)

Appendix A - Color, Resolution, and Graphic Adaptors

General Information A-1

Appendix B - Hewlett Packard ThinkJet Configuration

General Information B-1

Configuration B-1
- Printer Preparation B-1
- PC Preparation B-1
- Program Execution B-1

Appendix C - Printing GHA Graphics In Wordperfect 5.1

General Information C-1

How to Use the Grab Utility C-1

Creating a Figure in Your WordPerfect Document C-2

Appendix D - 658-ASCII Utility

Introduction D-1

Terminology D-1

Conventions D-1

Required Equipment D-1

Installation D-2

Operation D-2

Problems D-4

ASCII Event File Format D-4

List of Keywords D-5

Common Event Information D-6

Table of Contents (Continued)

65X Events and Equivalent ASCII Events..... D-6
On/Off D-7
RMS D-7
Frequency D-8
Waveform D-8
Sensor D-11
Pseudo/Pseudo Prime D-11

List of Tables

4-1 Acceptable Ranges for Voltage and Current..... 4-12
4-2 RMS Thresholds 4-13
4-3 Impulse/Waveshape/Frequency Thresholds..... 4-14

CHAPTER 1
INTRODUCTION

General Information

The Dranetz 658 Graphical and Harmonic Analysis (GHA) software package is a PC based, menu driven program that is used to analyze data that was collected on a Dranetz Series 656A, 657, or 658 Analyzer (versions 3.0 and higher).

This operator's guide shows:

- How to install and operate the software.
- How to import the analyzer's data remotely by modem, locally via direct serial connection, or directly with data disks.
- How to conduct graphical and harmonic analyses.
- How to integrate your data and analyses into written reports.

What's In This Manual

This manual contains five chapters: Introduction, Getting Started, Disk Functions and Database Management, Communications, and Data Analysis.

Introduction gives a brief introduction to the rest of the manual, lists the items included in the package, and lists the terms and conventions used in this manual.

Getting Started gives you equipment and system requirements, software installation instructions, and an introduction to operating the software with your personal computer.

Disk Functions and Database Management shows how to transfer data from an analyzer's data disk to your PC, and also how to manage the transferred data files on your hard disk.

Communications provides detailed descriptions of all modem and direct connection options. This chapter shows how to transfer data from a remote analyzer and how to change an analyzer's main channel and sensor channel setups.

Data Analysis offers complete instruction on viewing graphic summaries, viewing and understanding individual events, and performing harmonic analysis on waveforms.

Included In This Package

The following items are included in this package.

- One 3½ inch program diskette (labelled 658-OS-2001).
- One 3½ inch program diskette (labelled 658-ASCII-UTIL).
- One Operator's Guide (this manual).
- One RS-232 cable, 25-pin male to 25-pin female, (P/N 113376-G1) for connection between the PC and the analyzer. (Can also be used to connect the PC and an external Hayes Smartmodem.)
- One 25-pin male to 9-pin female adapter cable (P/N 113394-G1).

If any of the above items are missing from your package, please contact Dranetz Sales Department immediately at Telephone (908) 287-3680, FAX (908) 248-9240.

Terminology

Important terms used in this manual are identified below.

Analyzer
The term analyzer will be used throughout this manual to indicate a Dranetz 656A, 657, or 658 Analyzer. The model numbers will only be used if an operation pertains to a specific unit.

PC or Personal Computer
The terms "PC" and "Personal Computer" will be used throughout this manual to indicate the equipment required to run this software.

Data Disk
The term "Data Disk" refers to the 3½ inch diskette that contains event data collected on an analyzer.

Program Disk
The term "Program Disk" refers to the diskette included in this package that is labeled "658-OS-2001"

Conventions Used In This Manual

The following conventions are used in this manual to make the contents easier to understand.

Text-On-Screen and Field Names

Text appearing on screen and Field Names appearing in dialog boxes are indicated in quotation marks. For example: "Location name", "String", and "Enter MM/DD/YY".

Computer Command Keys

Computer command keys are represented by an italicized word in brackets. For example: <*Esc*>, <*Tab*>, and <*Enter*>

Options

An option offered by a menu or dialog box is represented by small caps. For example: MODEM CONNECTION, BACKUP, CANCEL, and FORWARD.

Entering Text

Whenever you are required to type in a string of text, you are prompted with the letters, numbers, and characters to be typed in boldface. For example:

Type: **658GHA**

CHAPTER 2
GETTING STARTED

General Information

This chapter describes the equipment needed to run the 658 GHA software. It also shows you how to setup your computer, how to install and run the program, and basic program operation.

What You Must Already Know

To run the Dranetz 658 GHA software, you must have a working knowledge of a 656A, 657, or 658 Analyzer.

This operator's guide assumes that you possess a basic familiarity with a personal computer, its operating system, and printer.

Required Equipment

Dranetz 658 GHA software runs on an IBM Personal Computer (286, 386 or 486), or 100% compatible IBM clone, equipped with the following features:

- One hard disk (20Mb minimum is recommended).
- One double-sided 3½ inch disk drive (A, B, C, or D) working with the BIOS without requiring external drivers.
- An IBM Graphics Adapter capable of displaying EGA or VGA graphics modes. (256K of video memory recommended for optimum viewing resolution and color display - refer to Appendix B).
- 640k minimum random access memory (RAM).
- Disk operating system MS/PC DOS, version 3.1 or higher.

Optional Equipment

The following equipment may be used when running the Dranetz 658 GHA software:

- Microsoft Mouse with Mouse Driver, version 6.11 or higher.
- A math co-processor (80287, 80387). Check your PC user's guide for the model required by your computer.
- Printer - Refer to page 4-18 for supported printers.
- 1MB or more of expanded memory conforming to LIM 4.0 specification or XMS 2.0 or higher.
- A Hayes 1200 or 2400 baud Smartmodem. (Required for a communication link with a 658 if not using a direct serial connection.)

Configuring Your Personal Computer

Check your system's AUTOEXEC.BAT and CONFIG.SYS files for any DOS resident programs, device drivers, or "terminate-and-stay-resident" (TSR) programs (also known as memory resident programs). Any such programs and drivers (other than a mouse driver), must be removed prior to installing the GHA program because they take up room in your PC's RAM and may cause memory conflicts that will interfere with the operation of the 658 GHA software.

If you are running the 658GHA software on a personal computer that has extended memory, and you are using DOS memory managers, the following three lines must be added to your CONFIG.SYS file:

```
device=himem.sys
device=emm.386.exe ram 512
dos=high,umb
```

Consult your DOS reference manual for more detailed information.

Installing the Program

The 658 GHA program must be installed on your hard disk in its own directory. For the following procedure it is assumed that your hard disk is drive C and your floppy drive is drive B.

At the C:\> prompt, type **md 658GHA** (or any valid directory name) and press <*Enter*>, then type **cd \658GHA** and press <*Enter*>. Insert the program disk into drive B then type **copy b: *.*** and press <*Enter*>. When the files are finished copying, remove the program disk and store in a safe place.

Running the Program

At the C:\> prompt, type **cd \658GHA** and press <*Enter*>, then type **658GHA** and press <*Enter*>.

NOTE

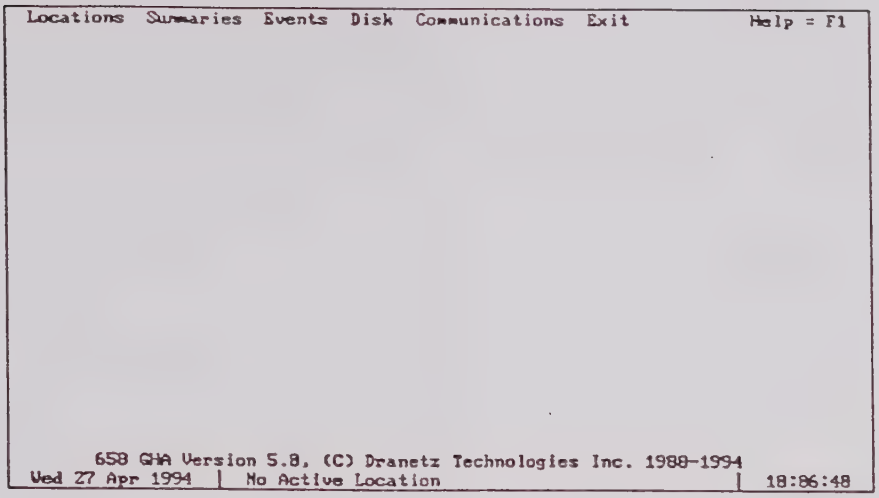
Do not run the program from the program disk, because it does not have adequate storage space for data files.

Monochrome Operation

The GHA program normally runs in color. To run the program in monochrome, type **658GHA /B** at the C:\658GHA> prompt, and press <*Enter*>.

When you run the program a Dranetz logo appears on the screen; press <*Space Bar*> to clear it. The next screen that appears is a message screen containing the copyright notice. To clear the message, press <*Space Bar*>; if you have a mouse, position the mouse cursor between the brackets and click the left mouse button.

When you clear the notice the Main Menu screen will appear, as illustrated below.


Locations Summaries Events Disk Communications Exit Help = F1
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 27 Apr 1994 | No Active Location | 18:06:48

Main Menu Description

The Main Menu screen has options that are listed across the top. All Main Menu options have an associated pull-down menu which is described below. The bottom line of the screen has the current date on the left and the current time on the right, according to your PC's internal clock. The area between the date and time displays either the name of the active location or the message, "No Active Location."

Locations

With this option, you can select a location file on which to perform data analysis (using the Summaries or Events options).

A location file is a file containing event data retrieved from an analyzer.

This option also lets you perform database management functions on individual location files. These functions include renaming, backing-up, deleting, restoring, and displaying the size of the file.

These functions are described in chapter 3.

Summaries

This option lets you view graphic summaries of events in the active location file. You can zoom in and plot specific intervals, or you can opt to view individual events, starting with the first event in the plot displayed on screen.

These functions are described in chapter 5.

Events

This option lets you view individual events in the active location file by selecting the event number or the time and date the event occurred. When viewing individual waveform events, a harmonic analysis can be performed on a complete cycle in the waveform.

These functions are described in chapter 5.

Disk

This option lets you read data directly from a data disk and place it in a location file on your PC's hard disk. A selection under this option lets you know how much room is on your hard disk.

This function is described in chapter 3.

Communications

This option lets you set the PC's communications parameters for remote (modem) and local (direct) communications with an analyzer, and allows you to select a printer. This option also allows you to make the connection, retrieve data, clear the analyzer's memory, and change the threshold setups.

These functions are described in chapter 4.

Exit

This option allows you to exit the program and return to DOS.

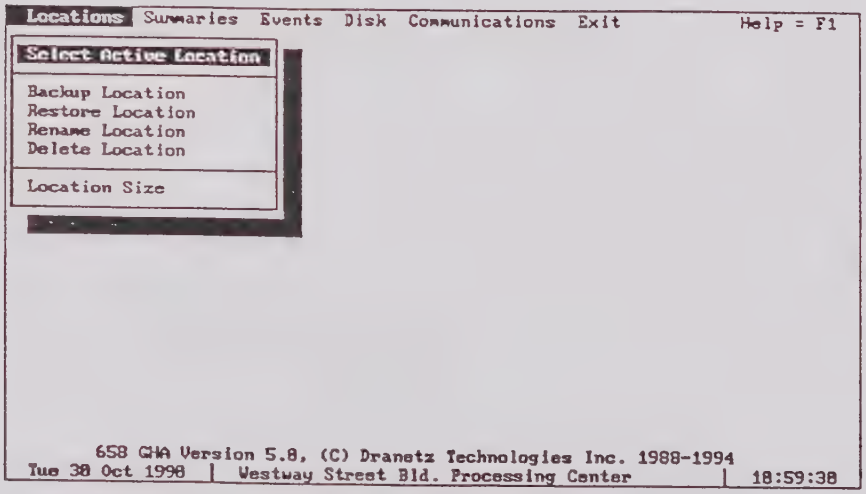
Help=F1

This option causes a dialog box to appear that briefly explains how to select options from the menu.

Pull-Down Menus

A pull-down menu is an option located across the top of a screen, and which contains two or more hidden options. On the Main Menu, all of the options are pull-down menus except for HELP. These hidden options are revealed when the menu title is selected. The Locations pull-down menu is shown below. To select it, press and release the <*Alt*> key, and then press the <*L*> key.

Locations Pull-Down Menu



Selecting Menu Options

The Dranetz 658 Graphical and Harmonic Analysis software is menu driven. To operate the program, you select options from its menus using either the keyboard or a mouse. The steps involved in selecting options from the Main Menu and pull-down menus are discussed below.

Keyboard

All of the steps necessary for operation of the GHA software can be performed with keyboard strokes.

Main Menu

Press and release the <*Alt*> key to activate the Main Menu. A key letter in each option is highlighted. The first option, Locations, is also enclosed in a box.

Pressing <*Enter*> selects the option enclosed in the box. Press the right or left arrow key to move this box to a different option.

Selecting an option causes its pull-down menu to appear.

An alternate way to select an option is to press the letter key corresponding to the colored or highlighted letter in the option's name, for example: Press <*L*> to select LOCATIONS. Press <*X*> to select EXIT. For the HELP=F1 option, press the <*F1*> function key.

If you've selected the wrong function, press the <*Esc*> key to exit the pull down menu, or press the left or right arrow key to move to another selection.

Pull-Down Menu

A pull-down menu lists several options; a key letter in each option is highlighted. A box encloses the first option in the list.

Pressing <*Enter*> selects the option enclosed in the box. Press the up or down arrow key to move the box to a different option.

An alternate way to select an option is to press the letter key corresponding to the colored or highlighted letter in the option's name.

Mouse

The Graphical and Harmonic Analysis software allows you to use a mouse for menu selections. If a mouse is connected to your PC, the mouse cursor appears in the form of a bar.

The left mouse button performs your execute or select functions. These are equivalent to your keyboard's <*Enter*> key.

Main Menu

To select an option from the Main Menu, position the mouse cursor over that option and click the left mouse button.

Selecting an option causes its pull-down menu to appear.

To exit a pull-down menu, select another Main Menu option or move the mouse cursor outside of the menu and click the left mouse button.

Pull-Down Menu

To select an option from a pull-down menu, position the mouse cursor over that option and press the left mouse button.

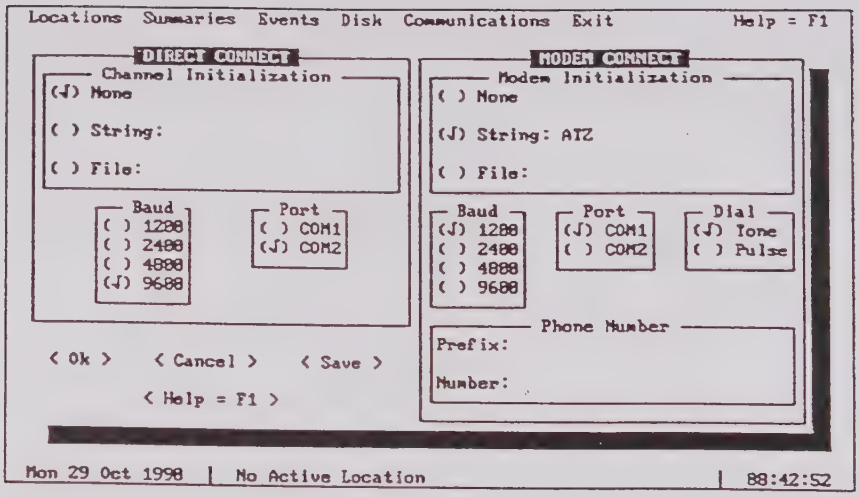
Dialog Boxes

Many of the options on the pull-down menus cause a dialog box to appear when selected. A dialog box displays information pertinent to the function being performed, and often prompts the user for additional information. The following example will show the Change Parameters dialog box.

Example Dialog Box

To view the Change Parameters dialog box, select COMMUNICATIONS from the Main Menu, then select CHANGE PARAMETERS from the pull-down menu.

Change Parameters Dialog Box



The items in the dialog box that you can select or change are indicated by brackets, a blank box (text entry field), or a check mark.

Selecting Items with the Keyboard

The underline cursor indicates which item will be affected when you use the keyboard. Press the <*Tab*> key to move the cursor between groups (Baud, Port, Phone Number, etc.).

To enter text, move the cursor to the desired field and enter the text.

To select one of the bracketed items, move the cursor to the item you want to activate, and press <*Enter*>.

To move a check mark, move the cursor to the check mark, and press the up or down arrow key.

Selecting Items with the Mouse

To enter text, position the mouse cursor in the field and click the left mouse button. The underline cursor appears in the field, indicating you can now type in the desired text.

To select one of the bracketed options, position the mouse cursor between the brackets and click the left mouse button.

To move a check mark, position the mouse cursor inside a set of empty parentheses and click the left mouse button.

CHAPTER 3
DISK FUNCTIONS AND DATA BASE MANAGEMENT

General Information

This chapter describes the functions performed with two of the Main Menu options, DISK and LOCATIONS.

If your PC has a 3½ inch drive, DISK allows you to read event data directly from a data disk and store it in a location file on your hard disk. DISK also lets you know how much room is available on your hard drive.

NOTE

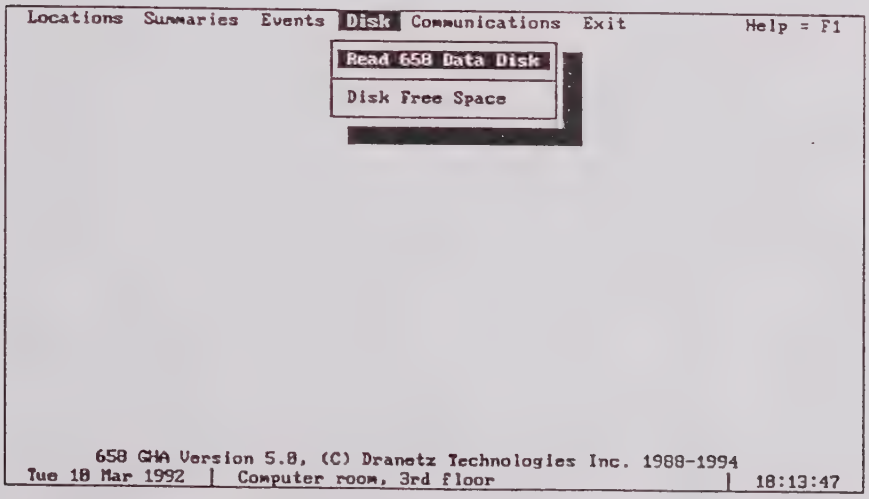
Only double-sided, double-density diskettes (720k) should be used as data disks in an analyzer. To avoid disk read errors if a high-density disk has been used, the extra hole can be covered with a piece of tape.

LOCATIONS contains the database management tools for maintaining your location files.

Disk Functions

The Disk pull-down menu appears when DISK is selected from the Main Menu.

Disk Pull-Down Menu


Locations Summaries Events Disk Communications Exit Help = F1
Read 658 Data Disk
Disk Free Space
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 18 Mar 1992 | Computer room, 3rd floor | 18:13:47

The two options on the Disk Menu are READ ANALYZER DATA DISK and DISK FREE SPACE.

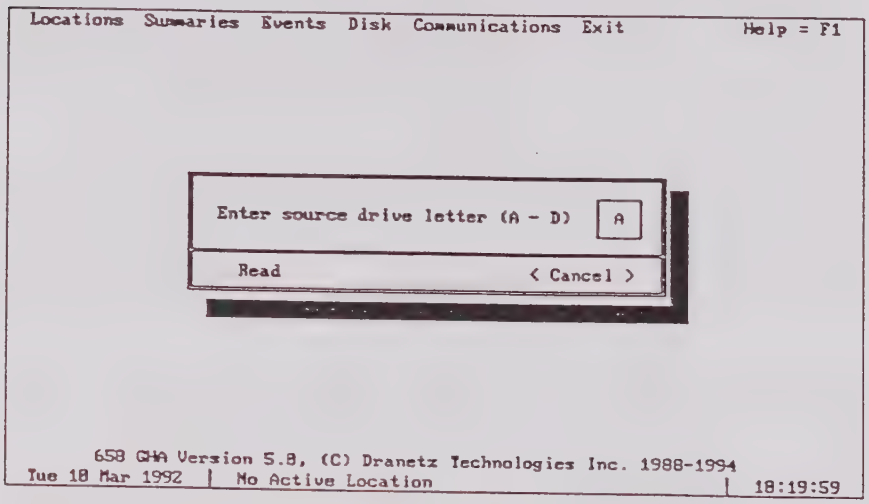
Read 658 Data Disk

The 658 GHA software can read either 9 sector (IBM format) disks, or 18 sector (Dranetz format) disks. A 9 sector disk is a disk that has been formatted on a 658, version 4.0 or higher. An 18 sector disk is a disk that has been formatted on a 656A, 657, or 658, version 3.x or below. The PC software, version 4.0 or higher, reads the correct format automatically.

Refer to the "Required Equipment" section in chapter 2 to be certain that your 3½ inch drive can accept analyzer data disks. To read data directly from a data disk, first insert the disk into the PC's 3½ inch drive, then select READ 658 DATA DISK from the Disk Menu.

A dialog box appears, prompting for the letter of the drive where the data disk is located.

Disk Dialog Box

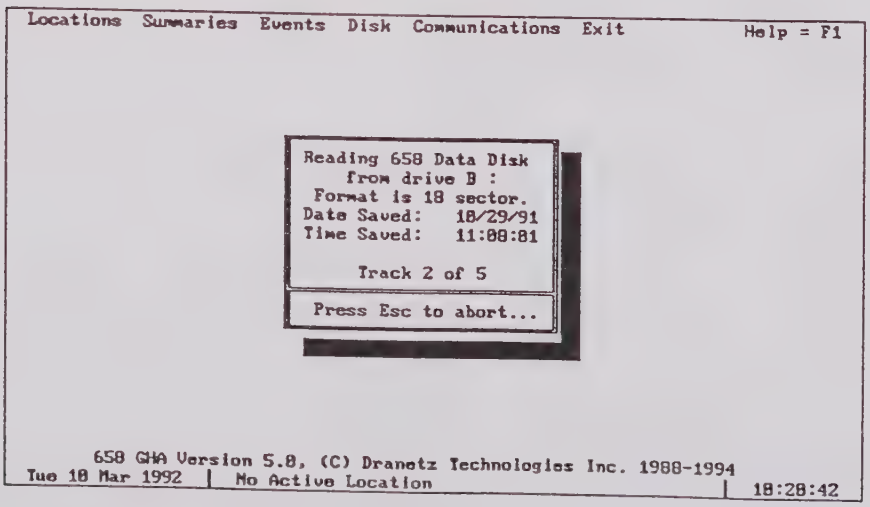

Locations Summaries Events Disk Communications Exit Help = F1
Enter source drive letter (A - D) A
Read < Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 18 Mar 1992 | No Active Location | 18:19:59

Drive A is the default drive. To accept this, select READ. To choose drive B, C, or D, press the corresponding letter key, and select READ.

To return to the Main Menu without reading the data disk, select CANCEL.

When READ is selected, a dialog box (such as the one in the illustration below) appears on the screen.

Data Disk Transfer Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Reading 658 Data Disk
from drive B :
Format is 18 sector.
Date Saved: 10/29/91
Time Saved: 11:00:01
Track 2 of 5
Press Esc to abort...
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 18 Mar 1992 | No Active Location | 18:28:42

The dialog box indicates the source drive; the disk format (9 or 18 sectors); and the date and time the analyzer saved the data to the data disk.

If you select the wrong drive, or if a data disk is not in the selected drive, an error message appears instead.

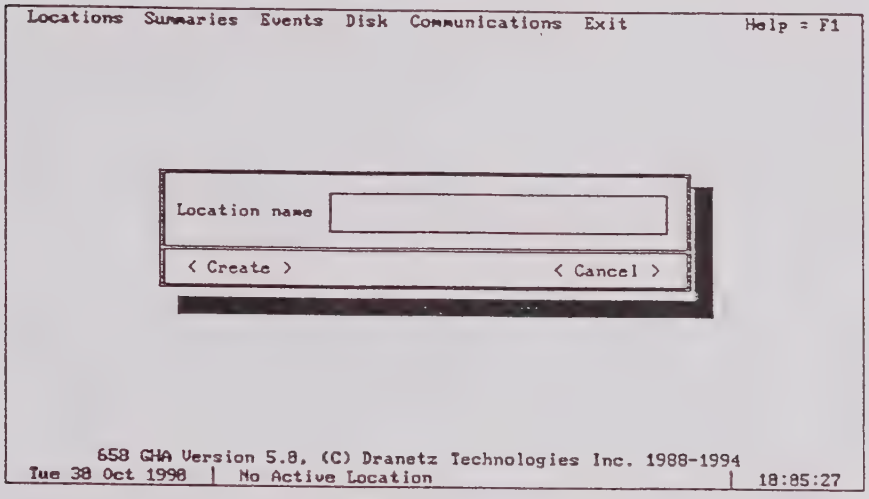
The dialog box displays a count of the tracks as they are being read.

To abort the process, press the <*Esc*> key.

The data is saved in a temporary file on the PC. The data in the temporary file is in a compressed format that the PC cannot readily understand or display. This data must be converted by GHA and stored in a location file.

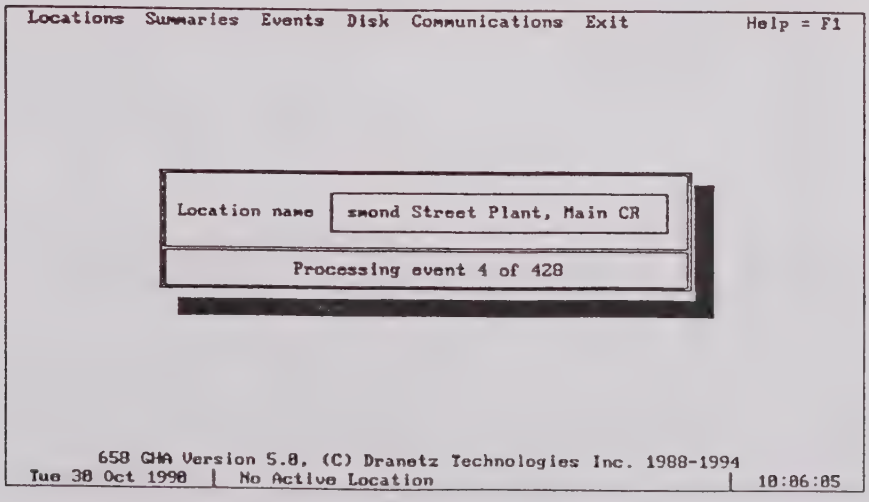
When all the tracks have been read, a new dialog box appears, prompting for a name for the location file. (Illustrated below.) You may safely remove the data disk from the drive when you see this display.

Location Name Dialog Box (Blank)


Locations Summaries Events Disk Communications Exit Help = F1
Location name
< Create >
< Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 30 Oct 1990 | No Active Location | 10:05:27

A name consisting of up to 42 characters can be assigned to the location file. The <*Backspace*> key can be used to delete the previous keystroke(s) when typing a location file name. When finished typing in the location name, select CREATE. GHA displays a running count of the events as they are converted.

Location Name Dialog Box (Text Entered)


Locations Summaries Events Disk Communications Exit Help = F1
Location name
smond Street Plant, Main CR
Processing event 4 of 428
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 30 Oct 1990 | No Active Location | 10:06:05

If CANCEL is selected instead of CREATE, the message "Discard Temporary File" is displayed briefly, and you are returned to the Main Menu.

When all the events have been converted and stored in the location file, the dialog box prompts you to press any key. Press a key and you are returned to the Main Menu. The newly created location file is now the active location file.

A date and a time are automatically added to the end of the file name in the location list. The date and time are readings from the analyzer's clock at the time the data was transferred to the data disk. They may not correspond to the date and time displayed at the bottom of your screen. They can deviate considerably if you're in a modem connection to an analyzer in a different time zone.

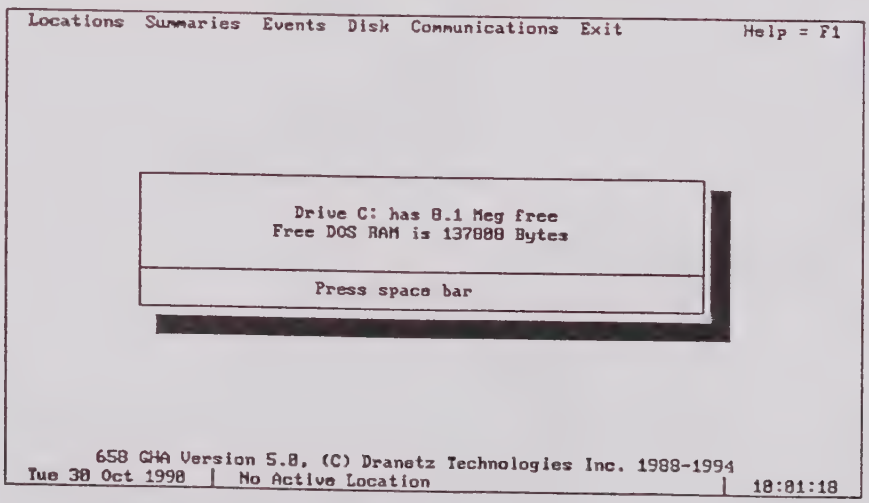
Each time GHA reads data from a data disk, it creates a new location file. It does not write over any existing location files, even if they are duplicate. If the same disk is read more than once, two or more location files may be created containing the same data.

Once a location file is created, data analysis functions can be performed on the data in the file. Turn to chapter 5 to learn the analysis functions and procedures.

Disk Free Space

To see how much space (measured in megabytes or kilobytes) is available on the hard drive the program is running from, select DISK FREE SPACE from the Disk Menu. The amount of free DOS RAM available in your computer's memory is displayed also. A dialog box appears on the screen, displaying this information, as illustrated below.

Disk Free Space Dialog Box

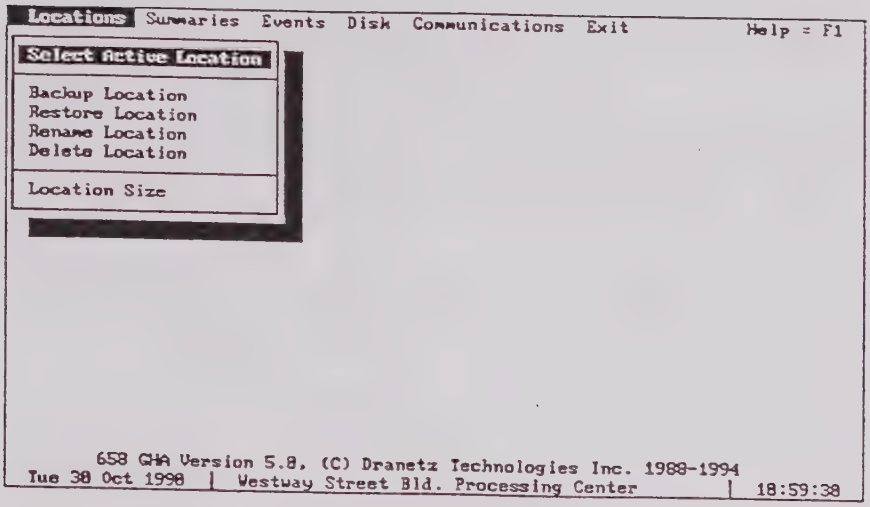

Locations Summaries Events Disk Communications Exit Help = F1
Drive C: has 8.1 Meg free
Free DOS RAM is 137888 Bytes
Press space bar
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 30 Oct 1990 | No Active Location | 18:01:18

Data Base Management

The Locations pull-down menu offers all the options necessary to maintain an orderly collection of files from the various analyzer locations. These files can be stored on your hard disk or on floppy disks.

When LOCATIONS is selected from the Main Menu, the following menu appears.

Locations Pull-Down Menu


Locations Summaries Events Disk Communications Exit Help = F1
Select Active Location
Backup Location
Restore Location
Rename Location
Delete Location
Location Size
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 30 Oct 1990 | Westway Street Bld. Processing Center | 18:59:38

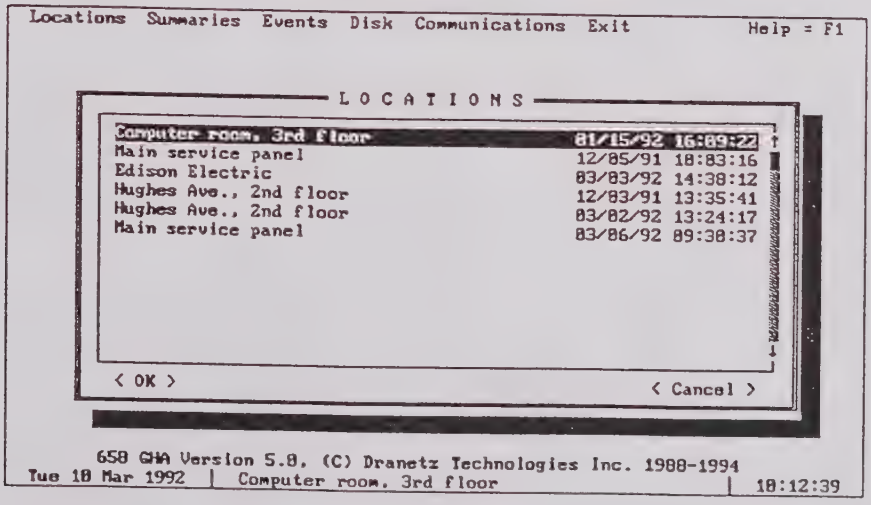
Each Locations Menu option (except RESTORE) modifies the active location file. If these options are selected when there is no active location, a list of available location files appears. Once a location file is selected, you proceed to the next screen.

Selecting Active Location File

The locations list is a list of all available location files. There are two times when the locations list appears. The first is when SELECT ACTIVE LOCATION is selected from the Locations Menu. The second is whenever an option that requires a location file is selected while there is no active location.

The locations list is illustrated below.

Locations List


Locations Summaries Events Disk Communications Exit Help = F1
LOCATIONS
Computer room, 3rd floor 01/15/92 16:09:22
Main service panel 12/05/91 18:03:16
Edison Electric 03/03/92 14:38:12
Hughes Ave., 2nd floor 12/03/91 13:35:41
Hughes Ave., 2nd floor 03/02/92 13:24:17
Main service panel 03/06/92 09:38:37
< OK >
< Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 10 Mar 1992 | Computer room, 3rd floor | 10:12:39

The date and time next to the file's name are from the analyzer's clock. This indicates when the data was transferred from the analyzer, to either the PC (using GHA software) or to a data disk. This date allows you to differentiate between several files with the same location name.

Select a location file with the mouse, or by moving the highlight with the up or down arrow key and pressing *<Enter>*.

The file you select becomes the active location file. It remains active until you select another location file, delete the file, create a new location file, or exit the software.

Backup Location File

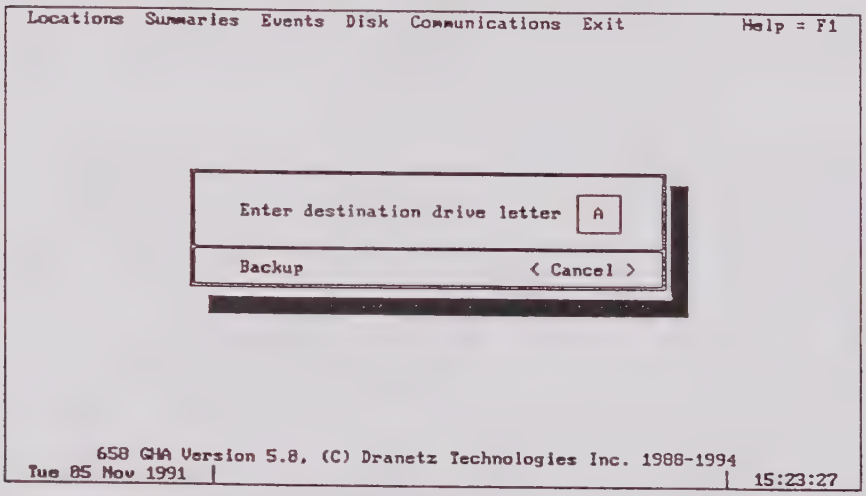
This option copies the active location file from the hard disk to a diskette.

CAUTION

DO NOT back up a location file through DOS because GHA will not be able to restore or access it.

When BACKUP LOCATION is selected from the Locations pull-down menu, a dialog box, such as the one in the illustration below, appears on the screen.

Backup Location Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Enter destination drive letter A
Backup < Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 05 Nov 1991
15:23:27

The dialog box prompts for the letter of the destination drive. The default destination drive is A. To change this, press the letter key corresponding to the correct drive. (Don't press <*Enter*> until you are ready to perform the backup.)

Insert a blank diskette into the destination drive. The BACKUP function overwrites any information already on the diskette. To backup more than one file on a diskette, refer to the next section.

Select BACKUP to copy the location file to the diskette. To abort the process and return to the Main Menu, select CANCEL. If the diskette is not large enough to hold the file, an error message appears.

Remove the disk before performing any further work with the software.

Backing Up Multiple Location Files Onto One Floppy Disk

When backing up location files to a floppy disk, GHA writes over any data that was previously saved. This allows you to save only one location file per floppy disk. This can be a limitation when you have several small location files to backup.

To overcome this limitation, create several subdirectories on the floppy disk and backup a location file to each subdirectory.

Insert a formatted floppy disk into the drive and log onto it; then, make a subdirectory or subdirectories on the disk. For example, if you want to make subdirectories LOC1 and LOC2 on a disk in drive B type the following commands: **B:\md loc1**, and **B:\md loc2**

Log onto the subdirectory that you want to save the file to. For example, if you want to save a location file to the LOC1 subdirectory, type the following command: **B:\cd loc1**

Start the GHA program and backup a location to the currently logged floppy disk drive. After you have backed up the location file, exit to DOS.

Repeat the above procedure for each location file that you want to backup on the same diskette.

Restore Location File

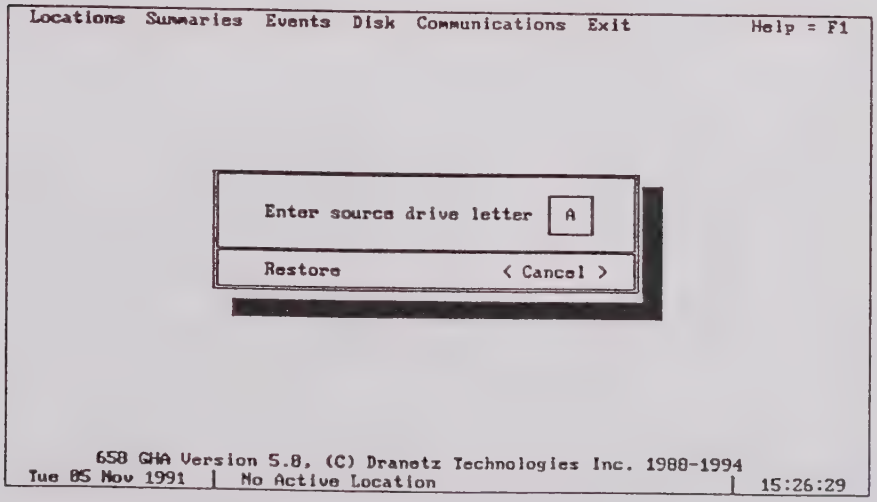
This option copies backed-up location files to the hard disk.

CAUTION

DO NOT use DOS to copy backed-up location files to the hard disk because GHA will not be able to access them.

When RESTORE LOCATION is selected from the Locations pull-down menu, a dialog box such as the one in the illustration below appears on the screen.

Restore Location Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Enter source drive letter A
Restore < Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 05 Nov 1991 | No Active Location | 15:26:29

The dialog box prompts for the letter of the source drive. The default source drive is A. To change this, press the letter key corresponding to the correct drive. (Don't press <*Enter*> until you are ready to perform the backup.)

Insert the backed-up diskette into the destination drive.

Select RESTORE to copy the location file to the hard disk. To abort the process and return to the Main Menu, select CANCEL.

The restored file becomes the active location. It has the same name it h when it was backed up.

Remove the disk before performing any other work with the software.

Rename Location File

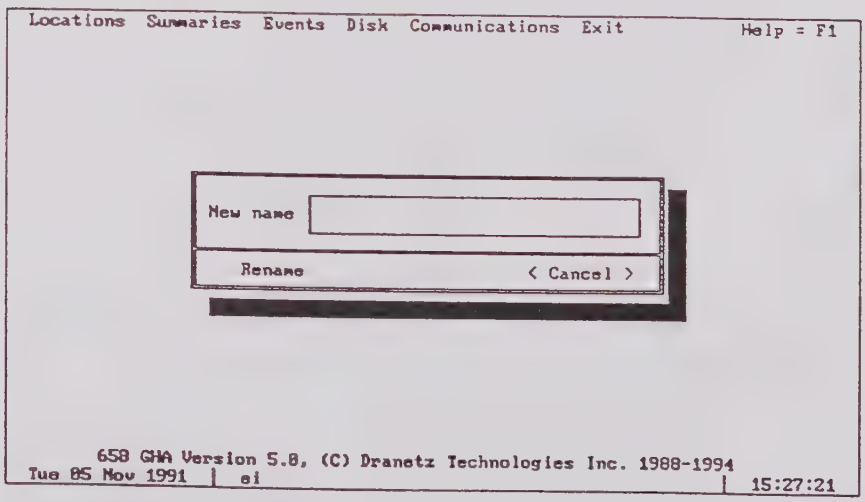
This option provides flexibility in location file management by allowing you to change the names of location files.

CAUTION

Do not use DOS to rename location files because GHA will not be able to access them.

When RENAME LOCATION is selected from the Locations pull-down menu, a dialog box, such as the one in the illustration below, appears on the screen.

Rename Location Dialog Box



The dialogue box prompts for a new name for the active location file. The name can be up to 42 characters. The *<Backspace>* key can be used to delete the previous keystroke(s) when typing a location file name.

Select RENAME to accept the new name or select CANCEL to leave the name unchanged and return to the Main Menu.

Delete Location File

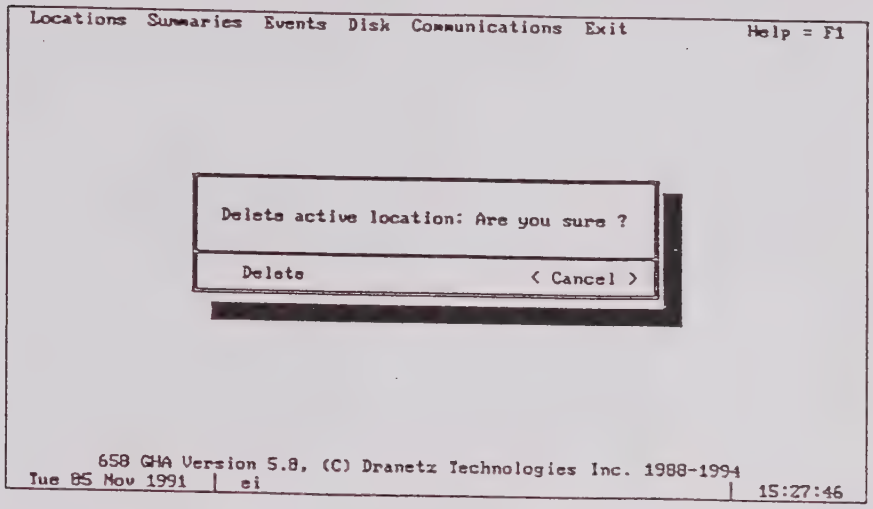
This option deletes the active location file from the hard disk.

CAUTION

Do not delete locations through DOS because their names will remain listed in the Locations list. If you select such a location file, the program will crash.

When DELETE LOCATION is selected from the Locations pull-down menu, a dialog box such as the one in the illustration below appears on the screen.

Delete Location Dialog Box


Locations Summaries Events Disk Communications Exit
Help = F1
Delete active location: Are you sure ?
Delete
< Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 05 Nov 1991 | ei
| 15:27:46

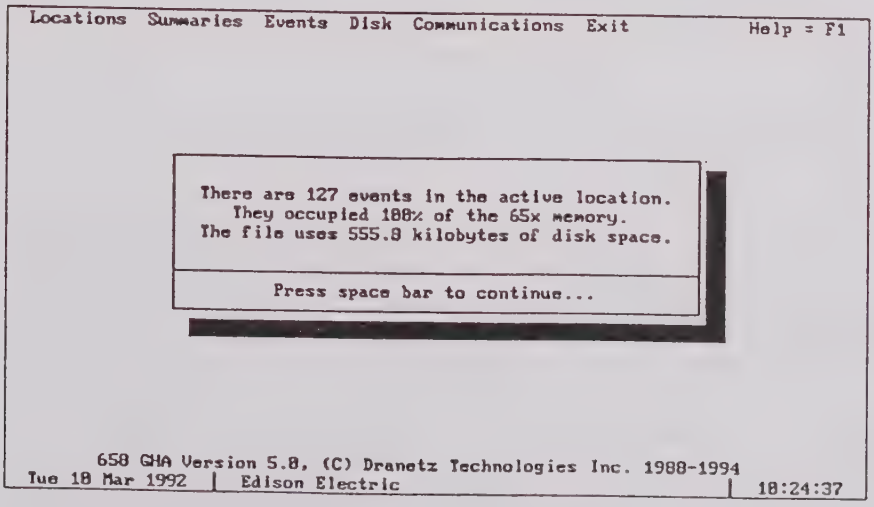
Select DELETE to delete the active location or select CANCEL to abort the deletion and return to the Main Menu.

Location File Size

This option displays information about the size of the active location file, including the number of events in the file, how much room the data in the file occupied in the analyzer memory, and how much room the file occupies on the PC.

When LOCATION SIZE is selected from the Locations pull-down menu, a dialog box, such as the one in the illustration below, appears on the screen.

Location Size Dialog Box


Locations Summaries Events Disk Communications Exit
Help = F1
There are 127 events in the active location.
They occupied 188% of the 65K memory.
The file uses 555.8 kilobytes of disk space.
Press space bar to continue...
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Tue 18 Mar 1992 | Edison Electric
| 18:24:37

CHAPTER 4
COMMUNICATIONS

General Information

The Communications chapter explains:

- How to set the program's communications parameters.
- How to establish the communications link.
- How to understand the status box.
- How to perform the available remote functions, which include retrieving data and changing the analyzer's main channel and sensor channel setups.
- How to store retrieved data in a location file.
- How to select a printer.

The two methods of retrieving data discussed in this chapter are through a direct serial connection and through a modem connection.

Direct Serial Connection

For local connections between the PC and the analyzer, the RS-232 cable supplied with this package (Dranetz P/N 113376-G1) should connect the Main Port on the analyzer to the PC serial port (Com1 or Com2). A cable up to 50 feet long can be used for direct serial communications.

When all connections are made, proceed to the Change Parameters section on page 4-4.

NOTE

The serial cable pinout for the PC to the analyzer's Main Port is male to female (PC side is female), with pins 1 through 8 and pin 20 connected pin to pin.

Modem Connection

If communication over public access phone lines is desired, both the analyzer and the PC must be equipped with modems.

Internal Modem

An optional 2400 baud internal modem is available for the analyzer and can be either factory or field installed. The field installation kit can be purchased from Dranetz (P/N 658-2400M). If an internal modem is not being used, a Hayes 1200 or 2400 external Smartmodem is recommended. Other modems may work with the analyzer, but are not guaranteed.

An interface cable (P/N 113873-G1) and phone line (P/N 111024-G1) are included with the modem option.

Before using the modem option, connect the interface cable between the Main and Communication ports o the rear panel and run the phone line from the modem's phone jack to your telephone system.

NOTE

If you are connecting to a public telephone system, refer to the 656A, 65[illegible] or 658 Operator's Manual for FCC procedures and considerations to be followed.

External Modem

Before connecting an external modem to the analyzer, its switches should be set as described below.

Hayes 1200 Smartmodem Switch Settings

To set up the Hayes 1200 Smartmodem for use with the analyzer, set its configuration switches as follows:

Switch	Position	Description
1	Down	DTR Ignored
2	Down	Result codes digitized
3	Down	Result codes displayed
4	Down	Character echo disabled
5	Up	Answer call on the first ring
6	Down	RS-232C carrier detect disabled
7	Up	Single line RJ-11 phone jack
8	Down	Command mode enabled
9	Up	Bell 103/212A mode
10	Up	DTR low = hang-up and return to command state

Hayes 2400 Smartmodem Switch Settings

The 2400 Smartmodem does not contain hardware switches like the 1200 Smartmodem. Its settings are initialized automatically by the analyzer.

Cable connection

Connect the modem to the analyzer's Main Port using Dranetz cable P/N 113446-G1, or follow the pin to pin circuit guidelines below:

Analyzer DB25 MALE		Hayes SmartModem DB25 MALE
1	----------	1
2	----------	3
3	----------	2
7	----------	7

Using an RJ-11C cable, connect the RJ-11C jack of the Hayes Smartmodem with an RJ-11 jack that connects to the public phone lines.

Connection to the PC

For use with the personal computer, it is recommended that you use one of the following modems: Hayes 1200 (external) Smartmodem, Hayes 1200B (internal) Smartmodem, Hayes 2400 (external) Smartmodem, or Hayes 2400B (internal) Smartmodem.

Hayes 1200B internal Smartmodem Switch Settings

To set up the Hayes 1200B internal Smartmodem for use with the PC, set its configuration switches as follows:

Switch	Position	Description
1	Right	Designates Smartmodem as COM1
	Left	Designates Smartmodem as COM2
2	Left	Single line telephone jack (RJ11)
3	Right	Carrier detect status enabled
4	Left	DTR low = hang-up and return to command state

Hayes 1200 external Smartmodem Switch Settings

To set up the Hayes 1200 external Smartmodem for use with the PC, set the modem configuration switches as follows:

Switch	Position	Description
1	Up	Support DTR
2	Down	Digit result codes
3	Down	Result codes enabled
4	Up	Character echo enabled
5	Down	Don't answer incoming calls
6	Up	RS-232-C carrier detect enabled
7	Up	Single line RJ-11 phone jack
8	Down	Enable command recognition
9	Up	Bell 103/212A mode
10	Up	DTR low = hang up and return to command state

NOTE

The cable provided in this package to connect the PC to the analyzer (Dranetz P/N 113376-G1) can be used to connect the modem to the PC since the pin designations are the same (pins 1 through 8, and pin 20, connected pin to pin).

Hayes Model 2400 (external) or 2400B (internal) Smartmodem

The Hayes 2400 and 2400B Smartmodems do not contain hardware switches like the 1200 and 1200B. The 2400 and 2400B modems are configured by sending an initialization string from the PC to various internal registers in the modem. The required initialization string is:

AT&D2V0Q0E1S0=0&C0&S0&J0B1L0&W0&Y0

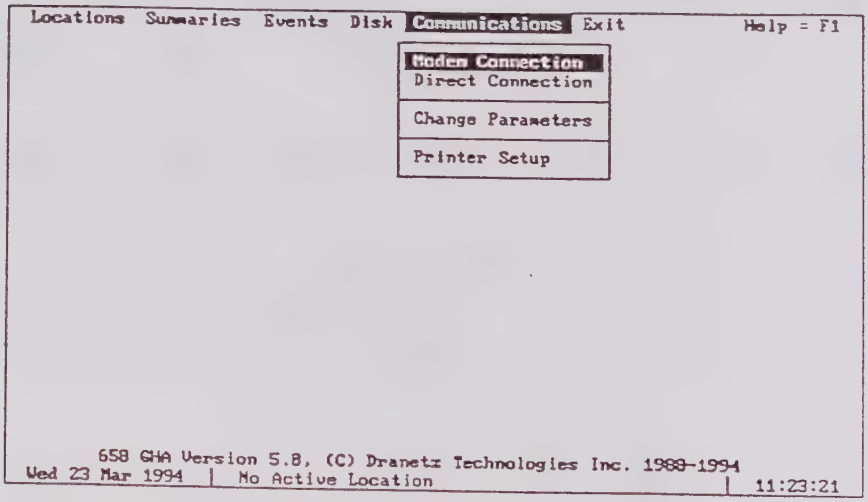
Refer to the next section for information on sending an initialization string to the modem.

It is assumed that your hardware connections are in place for communications.

Change Parameters

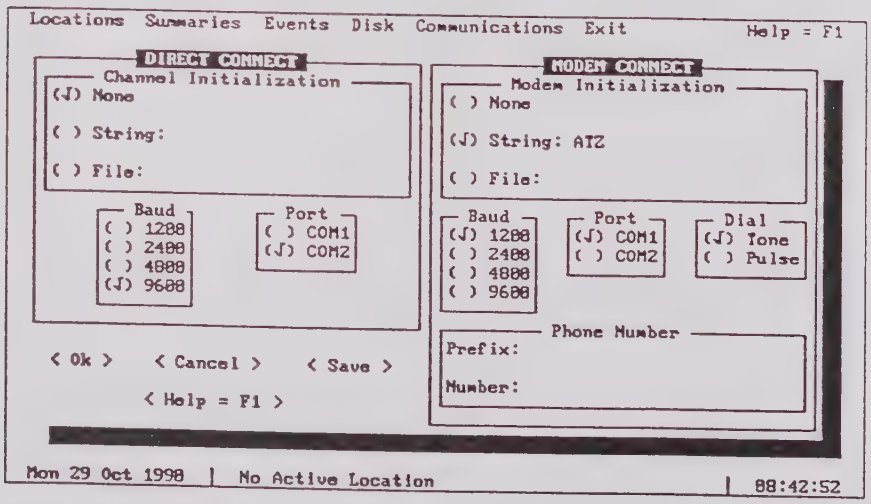
Before attempting communications with an analyzer, verify that your communications parameters are configured correctly. First, select COMMUNICATIONS from the Main Menu.

Communications Pull-Down Menu


Locations Summaries Events Disk Communications Exit Help = F1
Modem Connection
Direct Connection
Change Parameters
Printer Setup
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 23 Mar 1994 | No Active Location | 11:23:21

Then select CHANGE PARAMETERS from the pull-down menu.

Change Parameters Dialog Box



Press the <*Tab*> key to move the cursor between groups (Baud, Port, Phone Number, etc.) and press the up and down arrow keys to move the check mark through the selections within a group (1200, 2400, 4800, 9600 under Baud).

Modem Connect Parameters

Modem Initialization

Modem Initialization is used to set the modem's internal parameters. If the "String" or "File" parameters are selected, the contents of the string or file are sent to the PC's modem when MODEM CONNECTION is selected from the Communications pull-down menu.

None

Select this option if your modem does not need an initialization string.

String
This text field allows you to store your modem's initialization character sequence. The character string can be up to 128 characters long. "String" automatically places a carriage return at the end of the sequence. (If an ending carriage return is inappropriate for your modem, use "File.")

File
The modem's initialization character sequence can be put into a DOS file. If you create such a file, enter it's name in this text field. (The file must reside in the default directory; no file extensions are assumed.)

Baud
The following baud rates are available: 1200, 2400, 4800, 9600. The baud rate you select must match the analyzer's rate. Both modems must be able to handle this rate.

Port
This parameter tells the program which PC serial port is connected to the modem.

Dial
Select "Tone" for tone (touch tone) operated phone systems or "Pulse" for pulse (rotary) operated phone systems.

Phone Number
When entering the phone number of the remote analyzer, be sure to use only characters supported by your PC's modem. For example, older modems may not use such characters as "W" (wait-for-a-dial-tone), or lower case letters. In this case, use a comma (pause) in place of a "W". More than one comma may be needed.

Prefix
If your telephone system requires you to dial an access code to get an outside line, enter that code in this field.

If all of your calls are going to the same outside area code, you can enter "1" plus the area code in this field, and only change the number field when dialing different units.

Number
Enter the telephone number of the remote analyzer.

Direct Connect Parameters

Channel Initialization
Channel Initialization is useful in direct communications if the analyzer and PC are required to communicate through a network. If the "String" or "File" parameters are selected, the contents of the string or file are sent through the PC's serial port when DIRECT CONNECTION is selected from the Communications pull-down menu.

None
Select "None" if the PC and analyzer are connected only by an RS-232 cable.

String
This text field allows you to store your communication access code. The character string can be up to 128 characters long. A carriage return is automatically included at the end of whatever is typed in the field. (If an ending carriage return is inappropriate for your system, use "File.")

File
If your communications access code includes binary or hexadecimal characters, put them into a DOS file, and enter the name of that file here. (The file must reside in the default directory; no file extensions are assumed.)

Baud
The following baud rates are available: 1200, 2400, 4800, 9600. The baud rate you select must match the analyzer's rate.

NOTE

For fastest transfer of data, it is recommended that the baud rate for the direct connect mode be set to 9600.

Port
This parameter tells the program which PC serial port is connected to the analyzer.

Once Parameters Are Set

After changing the parameters, you must either confirm or cancel the changes. Each time the program is started, the communication parameters are set to the program's default settings.

OK saves the new settings until you exit the program.

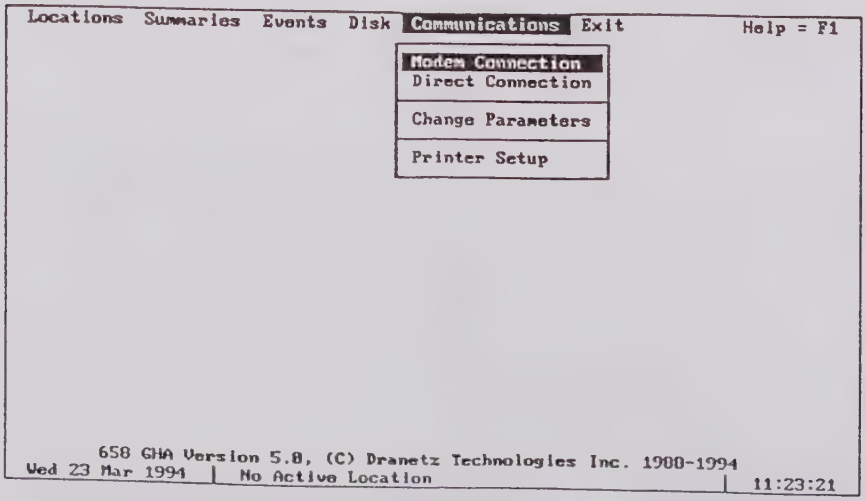
SAVE saves these settings as the program's new default settings.

CANCEL returns the settings to how they were prior to your changes and returns you to the Main Menu.

Establishing the Connection

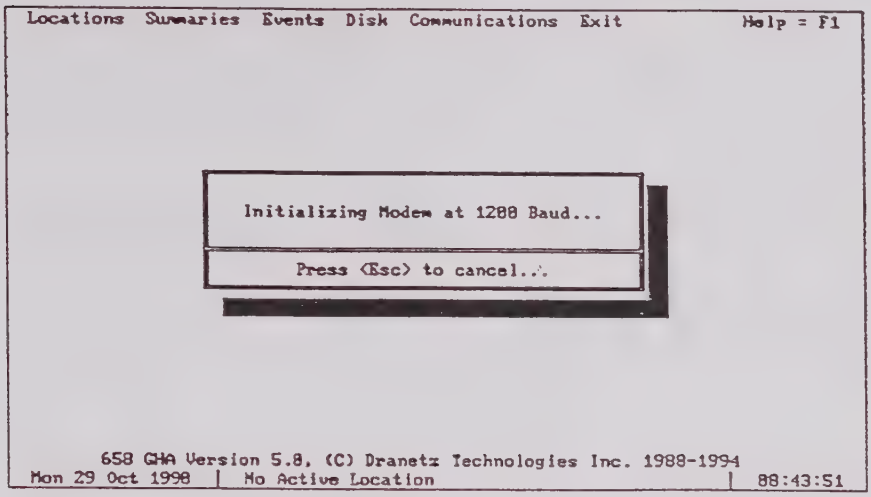
To start communicating by either a direct connection, or a modem connection, select COMMUNICATIONS from the Main Menu.

Communications Pull-Down Menu


Locations Summaries Events Disk Communications Exit Help = F1
Modem Connection
Direct Connection
Change Parameters
Printer Setup
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 23 Mar 1994 | No Active Location | 11:23:21

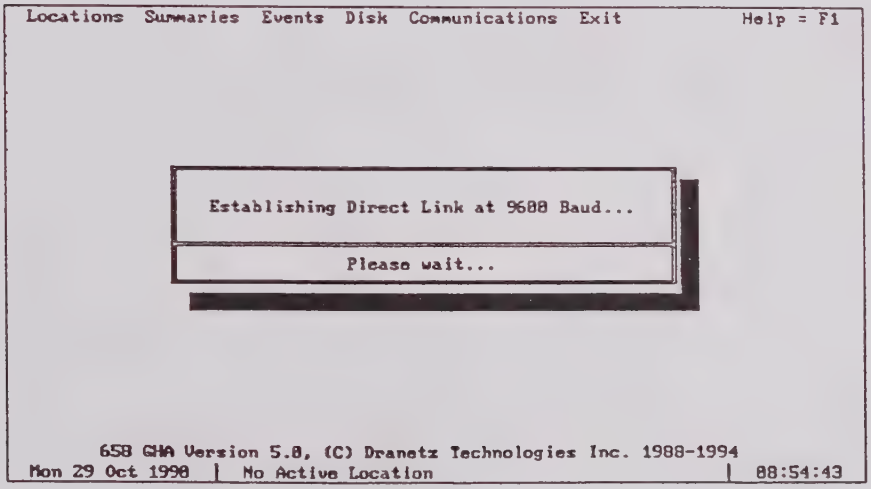
For modem communication, select MODEM CONNECTION from the pull-down menu.

Modem Connection Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Initializing Modem at 1200 Baud...
Press <Esc> to cancel...
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Mon 29 Oct 1990 | No Active Location | 08:43:51

For direct communication, select DIRECT CONNECTION from the pull-down menu.

Direct Connection Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Establishing Direct Link at 9600 Baud...
Please wait...
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Mon 29 Oct 1990 | No Active Location | 08:54:43

In either case, a dialog box appears that displays a message that shows the baud rate selected in the CHANGE PARAMETERS dialog box: 1200, 2400, 4800, or 9600.

If the Connection is Unsuccessful

The error message "Not a Valid Remote 656A/7/8" appears briefly if there are any errors in your hardware connections or parameter settings. The conditions which could cause this error are as follows:

- Remote and local modems are set to different baud rates.
- 656A or 658 not left in "Waiting for a Call" mode.
- Modem to analyzer interface cable not properly connected, missing, or wrong.

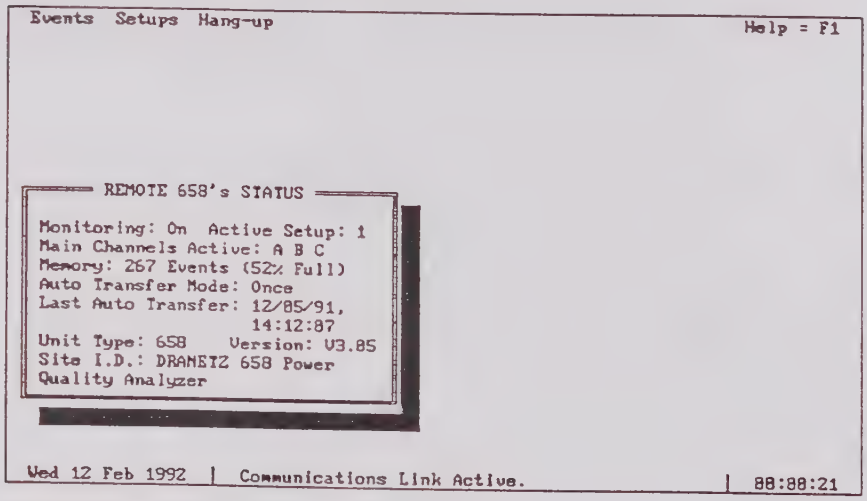
If the Connection is Successful

When the connection is made, the message, "Link Established!" is displayed briefly on the screen. The Main Menu is replaced by the Communications Menu. A dialog box showing the status of the remote unit appears on the left side of the screen. At the bottom of the screen, the message "Communications Link Active" is displayed. The clock on the bottom right hand of the screen keeps track of and displays the time elapsed since the connection was first established.

Status Box

The status box is illustrated below and the information it displays is explained in the following paragraphs.

Communications Menu With Status Dialog Box


Events Setups Hang-up
Help = F1
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: A B C
Memory: 267 Events (52% Full)
Auto Transfer Mode: Once
Last Auto Transfer: 12/05/91,
14:12:07
Unit Type: 658 Version: V3.05
Site I.D.: DRANETZ 658 Power
Quality Analyzer
Wed 12 Feb 1992 | Communications Link Active. | 00:00:21

Monitoring
This indicates whether the remote analyzer's monitoring is on or off.

Active Setup
There are sixteen monitoring setups available on an analyzer. The number displayed here indicates which one is in use.

Main Channels Active
The main input channels that are active are listed here.

Memory
This indicates how many events have been recorded and how much of the analyzer's memory is occupied.

Auto Transfer Mode
This indicates the setting of the analyzer's auto transfer mode. "Multiple" indicates that the contents of the analyzer's event memory will be transferred to its internal disk drive every time the memory fills. Any previously stored data will be written over. "Once" indicates that the contents of the analyzer's event memory will be transferred to its internal disk drive the first time the memory fills; the next time the memory fills, the data is not transferred, and monitoring stops (unless a new data disk is inserted in the unit).

Last Auto Transfer
If the analyzer has performed an automatic transfer of its event memory to a data disk, the time and date of the most recent transfer is indicated here.

Site I.D.
The name assigned to the remote analyzer is indicated here. This I.D. is entered from the 656A's, or 658's keyboard. A 657's site ID can be changed using the CHANGE 657 SITE ID selection on the Setups pull-down menu.

Communications Menu

The Communications Menu contains three options: EVENTS, SETUPS, and HANG-UP. Press the <*Alt*> key to activate the menu.

EVENTS allows you to control a remote analyzer by: retrieving data from its memory, clearing its memory, and changing its auto-transfer mode. Data can also be retrieved from a 657 data disk.

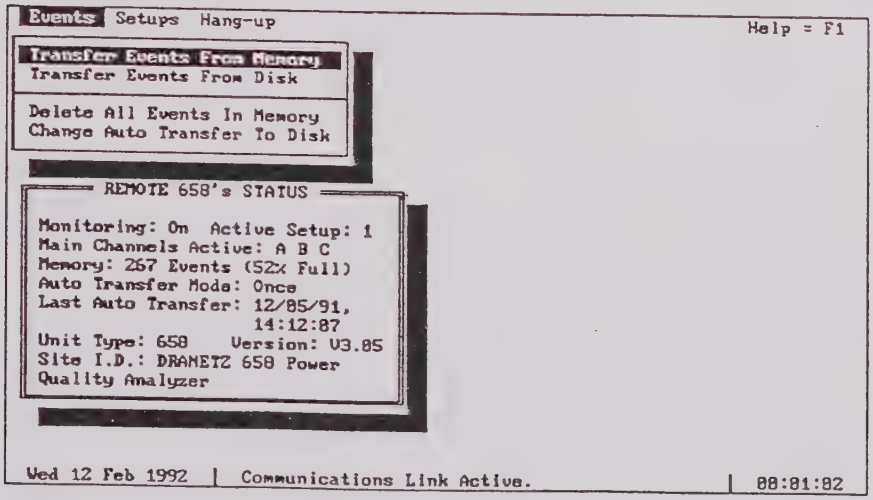
SETUPS allows you to view the main channel and sensor channel setups. The setups can then be changed, or activated, or both. A 657's site I.D. and clock also can be changed from this menu.

HANG-UP disconnects the communications link.

Transfer Events From Memory

To transfer events from the analyzer's memory, select EVENTS from the Communications Menu. The Events pull-down menu appears.

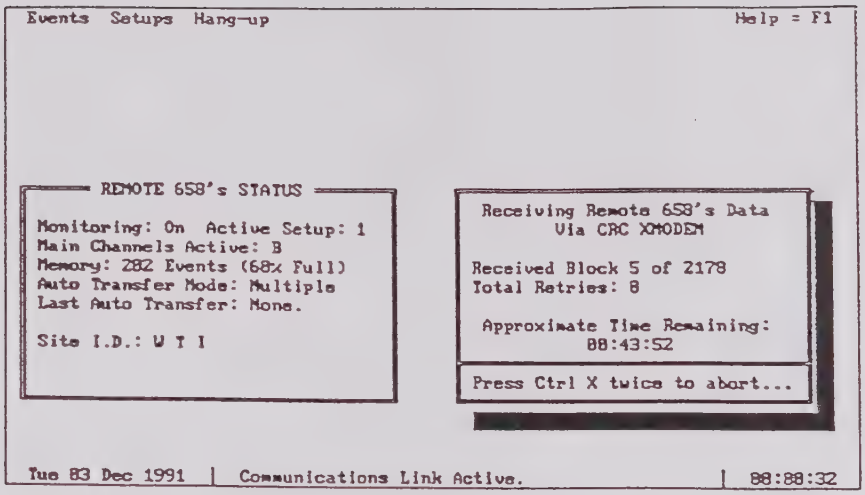
Events Pull-Down Menu


Events Setups Hang-up
Help = F1
Transfer Events From Memory
Transfer Events From Disk
Delete All Events In Memory
Change Auto Transfer To Disk
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: A B C
Memory: 267 Events (52% Full)
Auto Transfer Mode: Once
Last Auto Transfer: 12/05/91, 14:12:07
Unit Type: 658 Version: V3.05
Site I.D.: DRAMETZ 658 Power Quality Analyzer
Wed 12 Feb 1992 | Communications Link Active. | 08:01:02

Select TRANSFER EVENTS FROM MEMORY.

On the right-hand portion of the screen, a small box informs you that the software is "Requesting Transfer Information..." Then a larger box takes its place, as illustrated below.

Memory Transfer Dialog Box


Events Setups Hang-up
Help = F1
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: 8
Memory: 282 Events (68% Full)
Auto Transfer Mode: Multiple
Last Auto Transfer: None.
Site I.D.: W T I
Receiving Remote 658's Data
Via CRC XMODEM
Received Block 5 of 2178
Total Retries: 8
Approximate Time Remaining:
00:43:52
Press Ctrl X twice to abort...
Tue 03 Dec 1991 | Communications Link Active. | 00:00:32

Under the title, "Receiving Remote 658's Data," the second line reads either "Via CRC XMODEM" or "Via CHECKSUM XMODEM." These are the communications protocols.

This display counts the transferred data block by block. It offers a running estimate of the time it will take to complete the transfer.

The abort option allows you to stop the transfer at any point during the process. Press *<Ctrl>* + *<X>* twice to abort.

When the transfer is completed, "Approximate Time Remaining" is replaced by "Press any key to continue." The event data just transferred is stored in a temporary file. When you disconnect the communications link you are prompted to save this file to a location file.

Delete All Events In Memory

After performing a data transfer, you may want to clear the analyzer's memory to avoid duplicate data in your location files. This also allows more room for additional data to be collected.

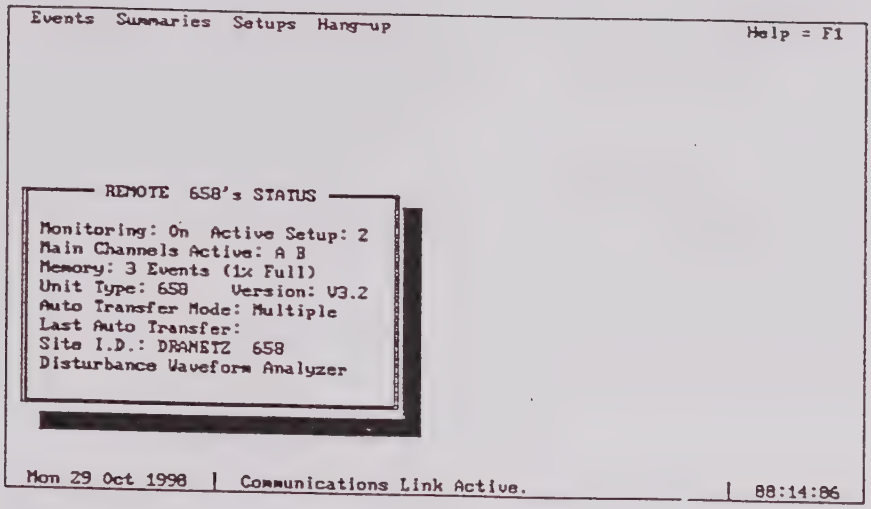
To clear the analyzer's memory, select DELETE ALL EVENTS IN MEMORY from the Events pull-down menu. You are prompted with a warning, asking you if you wish to continue or cancel the command.

Once you clear event data, the change is reflected in the status box.

NOTE

The analyzer will always contain a minimum of 3 events (initial readings) when monitoring is on.

Status Box After Events Were Deleted From Memory


Events Summaries Setups Hang-up
Help = F1
REMOTE 658's STATUS
Monitoring: On Active Setup: 2
Main Channels Active: A B
Memory: 3 Events (1% Full)
Unit Type: 658 Version: V3.2
Auto Transfer Mode: Multiple
Last Auto Transfer:
Site I.D.: DRANETZ 658
Disturbance Waveform Analyzer
Mon 29 Oct 1990 | Communications Link Active. | 00:14:06

Change Auto-Transfer to Disk

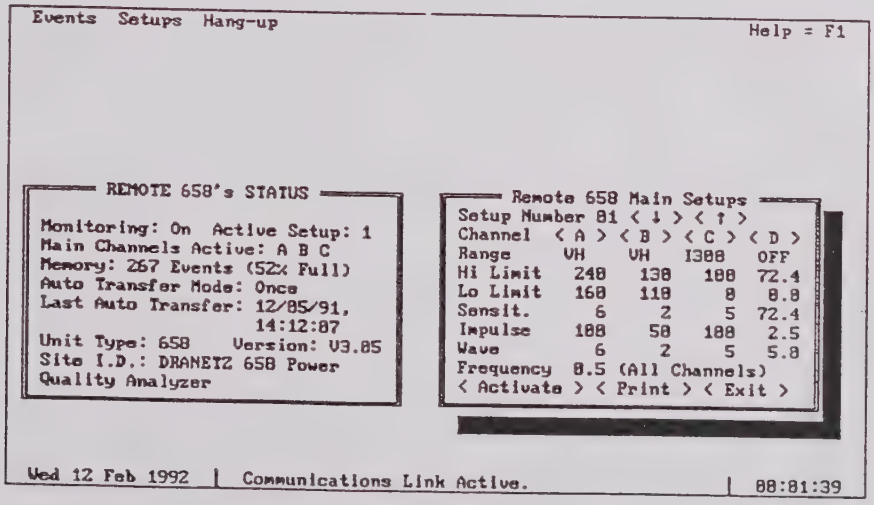
When CHANGE AUTO TRANSFER TO DISK is selected from the Events pull-down menu, a dialog box appears on the screen saying whether the mode is being changed from "Once to Multiple" or from "Multiple to Once."

As soon as the change is complete, it is reflected in the status box.

Activating a Main Channel Setup

To activate a new main channel setup, select MAIN CHANNEL from the Setups pull-down menu. A dialog box appears telling you that the setups data is being transferred. After a few seconds it is replaced by the remote setups dialog box, as shown below.

Main Channel Setups Dialog Box

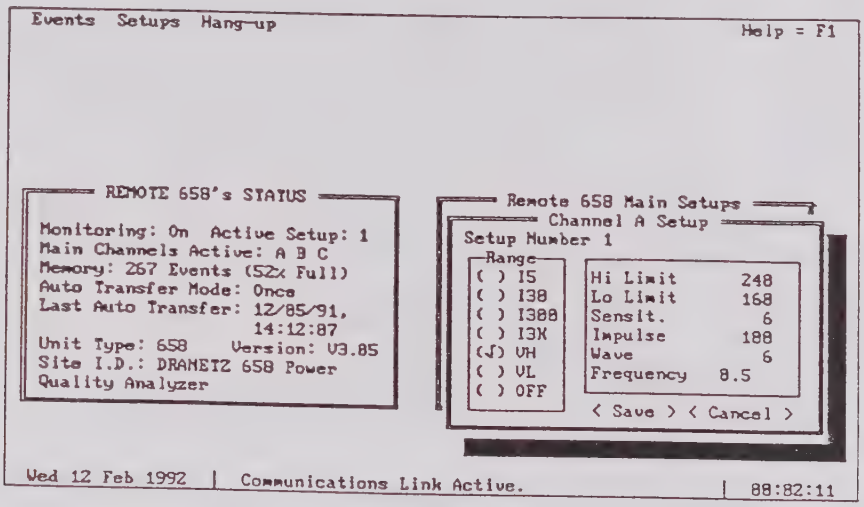

Events Setups Hang-up
Help = F1
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: A B C
Memory: 267 Events (52% Full)
Auto Transfer Mode: Once
Last Auto Transfer: 12/05/91, 14:12:07
Unit Type: 658 Version: V3.05
Site I.D.: DRANETZ 658 Power Quality Analyzer
Remote 658 Main Setups
Setup Number 01 < ↓ > < ↑ >
Channel < A > < B > < C > < D >
Range VH VH I300 OFF
Hi Limit 240 130 100 72.4
Lo Limit 160 110 0 0.0
Sensit. 6 2 5 72.4
Impulse 100 50 100 2.5
Wave 6 2 5 5.0
Frequency 0.5 (All Channels)
< Activate > < Print > < Exit >
Wed 12 Feb 1992 | Communications Link Active. | 00:01:39

Page through the setups by pressing the up and down arrow keys. When you get to a setup that you want to activate, move the cursor to ACTIVATE by pressing the <*Tab*> key, and then press <*Enter*>.

Changing a Main Channel Setup

Page through the setups until you get to the one that you want to change. Press the <*Tab*> key to move the cursor to the channel you want to change, and then press <*Enter*>. The channel setup dialog box will appear in front of the remote setups box as shown below.

Channel A Setup Dialog Box



The check mark next to items on the range list can be moved by pressing the up and down arrow keys. When the cursor is on the parameter that you want to change, type in the new value. If the new value does not fill the whole field, press <*Space Bar*> enough times to fill the field. When you have changed all the parameter values that you want to change, move the cursor to SAVE and press <*Enter*>. The changes will be accepted and the channel setup box will disappear. To cancel any changes that you have made, move the cursor to CANCEL and press <*Enter*>. The channel setup box will disappear.

Make changes to the other channel setups using the preceding instructions.

The following tables are provided as a reference when changing main channel setups.

Table 4-1. Acceptable Ranges For Voltage and Current

V RMS Range	V pk Impulse Range	Waveform (V RMS) Envelope
VH = 0 to 724 V RMS	24 to 6120 V	2 to 724 V
VL = 0 to 72.4 V RMS	2.4 to 612 V	0.2 to 72.4 V
OFF = No Monitoring		
A RMS Range	**A pk Impulse Range**	**Waveform (A RMS) Envelope**
I5 = 0 to 7.24 A RMS	0.24 to 25 A	0.02 to 7.24 A
I30 = 0 to 72.4 A RMS	2.4 to 250 A	0.2 to 72.4 A
I300 = 0 to 724 A RMS	24 to 2500 A	2 to 724 A
I3K = 0 to 7240 A RMS	240 to 25000 A	20 to 7240 A

Table 4-2. RMS Thresholds

Range	High Limit	Low Limit	Sensitivity
I5	0.01 - 7.24 A RMS	0.00 - 7.24 A RMS	0.01 - 7.24 A RMS
I30	0.1 - 72.4 A RMS	0.0 - 72.4 A RMS	0.1 - 72.4 A RMS
I300	1 - 724 A RMS	0 - 724 A RMS	1 - 724 A RMS
I3K	10 - 7240 A RMS	0 - 7240 A RMS	10 - 7240 A RMS
VH	1 - 724 V RMS	0 - 724 V RMS	1 - 724 V RMS
VL	0.1 - 72.4 V RMS	0.0 - 72.4 V RMS	0.1 - 72.4 A RMS

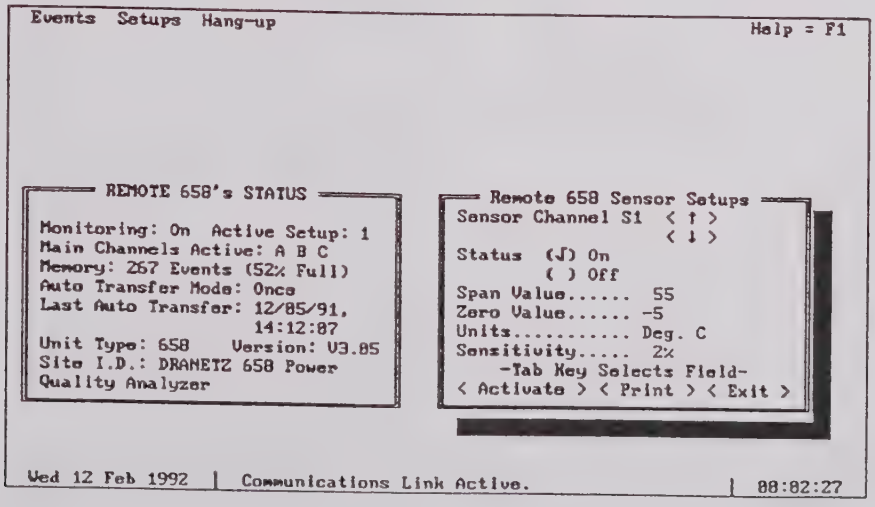
Table 4-3. Impulse/Waveshape/Frequency Thresholds

Range	Impulse Limit	Waveshape Limit	Frequency Sens
I5	0.24 - 61.20 Amps	0.02 - 7.24 ARMS	0.1 - 9.9 Hz
I30	02.4 - 612.0 Amps	0.2 - 72.4 ARMS	0.1 - 9.9 Hz
I300	24 - 6120 Amps	2 - 724 ARMS	0.1 - 9.9 Hz
I3K	240 - 61200 Amps	20 - 7240 ARMS	0.1 - 9.9 Hz
VH	24 - 6120 Volts	2 - 724 VRMS	0.1 - 9.9 Hz
VL	2.4 - 612.0 Volts	0.2 - 72.4 VRMS	0.1 - 9.9 Hz

Activating a Sensor Channel Setup

To activate a sensor channel setup, select SENSOR CHANNEL from the Setups pull-down menu. A dialog box appears telling you that the setups data is being transferred. After a few seconds it is replaced by the remote sensor setups dialog box, as shown below.

Sensor Channel Setups Dialog Box


Events Setups Hang-up
Help = F1
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: A B C
Memory: 267 Events (52% Full)
Auto Transfer Mode: Once
Last Auto Transfer: 12/05/91, 14:12:07
Unit Type: 658 Version: V3.05
Site I.D.: DRANETZ 658 Power Quality Analyzer
Remote 658 Sensor Setups
Sensor Channel S1 < ↑ > < ↓ >
Status (√) On ( ) Off
Span Value..... 55
Zero Value..... -5
Units..... Deg. C
Sensitivity..... 2x
-Tab Key Selects Field-
< Activate > < Print > < Exit >
Wed 12 Feb 1992 | Communications Link Active. | 08:02:27

Page through the setups by pressing the up and down arrow keys. When you get to a setup that you want to activate, move the cursor to the "Status" field and press the up arrow key to turn the channel on. Move the cursor to ACTIVATE and press *<Enter>*. The setups will be recompiled and the sensor setups box will disappear.

Changing a Sensor Channel Setup

Page through the setups until you get to the one that you want to change. Press the *<Tab>* key to move the cursor to the parameter you want to change and type in the new value. If the new value does not fill the whole field, press *<Space Bar>* enough times to fill the field. When you have changed all the parameter values that you want to change, move the cursor to ACTIVATE and press *<Enter>*. The changes will be accepted and the sensor setups box will disappear. If you want to keep the original settings for that channel, move the cursor to EXIT and press *<Enter>*

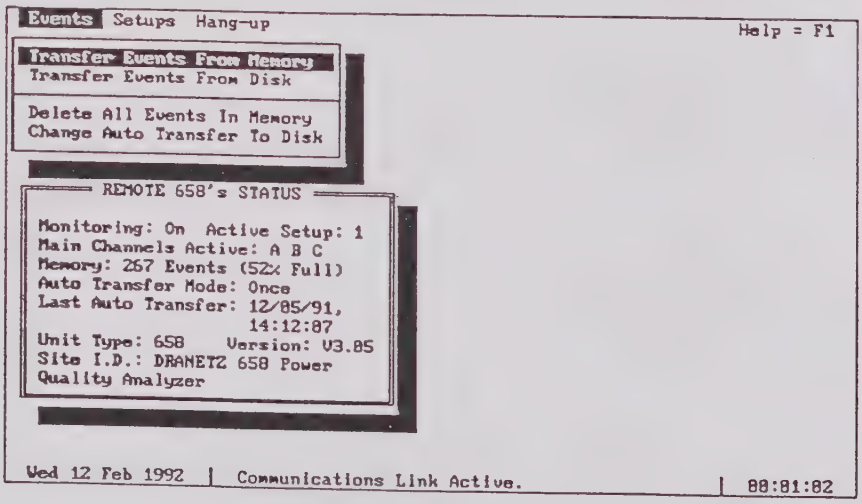
Special 657 Operation

There are three operations on the Communications Menu that can only be used when communicating with a 657 analyzer. These operations are: TRANSFER EVENTS FROM DISK, on the Events pull-down menu; CHANGE 657 SITE ID and SET 657 CLOCK, on the Setups pull-down menu. They are described in the following paragraphs.

Transfer Events From Disk

To transfer events from a data disk in the 657, select EVENTS from the Communications Menu. The Events pull-down menu appears.

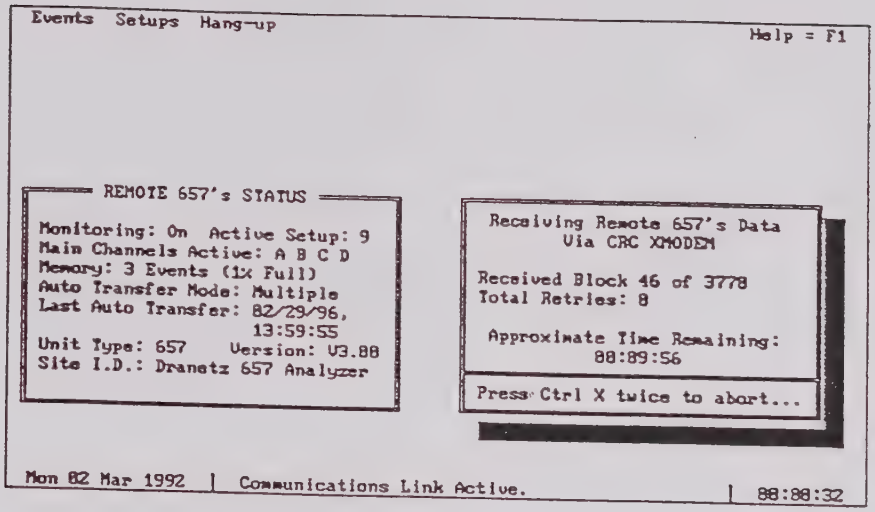
Events Pull-Down Menu


Events Setups Hang-up
Help = F1
Transfer Events From Memory
Transfer Events From Disk
Delete All Events In Memory
Change Auto Transfer To Disk
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: A B C
Memory: 267 Events (52% Full)
Auto Transfer Mode: Once
Last Auto Transfer: 12/05/91, 14:12:07
Unit Type: 658 Version: V3.05
Site I.D.: DRANETZ 658 Power Quality Analyzer
Wed 12 Feb 1992 | Communications Link Active. | 08:01:02

Then choose TRANSFER EVENTS FROM DISK from the pull-down menu. A dialog box appears telling you that information is being transferred. After a few seconds it is replaced by another box that counts the transferred data block by block. It offers a running estimate of the time it will take to complete the transfer.

The abort option allows you to stop the transfer at any point during the process. Press *<Ctrl>* + *<X>* twice to abort.

Disk Transfer Dialog Box

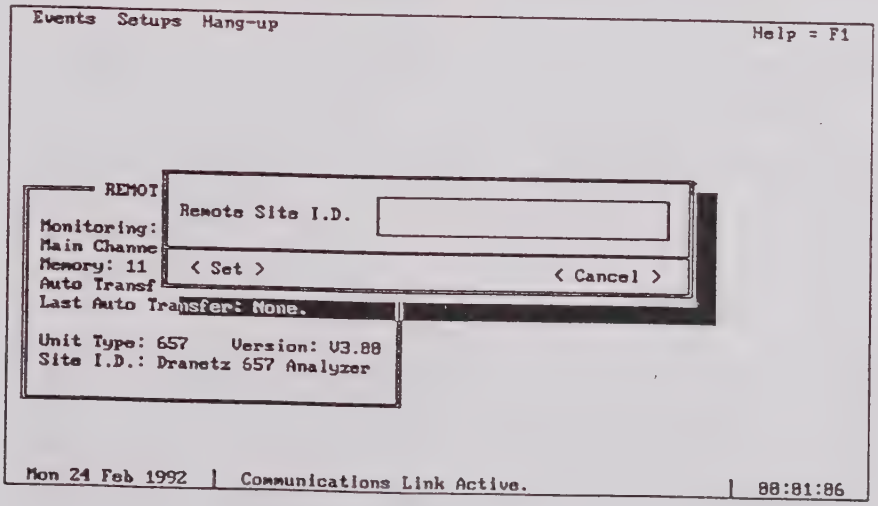

Events Setups Hang-up
Help = F1
REMOTE 657's STATUS
Monitoring: On Active Setup: 9
Main Channels Active: A B C D
Memory: 3 Events (1% Full)
Auto Transfer Mode: Multiple
Last Auto Transfer: 02/29/96, 13:59:55
Unit Type: 657 Version: V3.88
Site I.D.: Dranetz 657 Analyzer
Receiving Remote 657's Data Via CRC XMODEM
Received Block 46 of 3778
Total Retries: 8
Approximate Time Remaining: 00:09:56
Press Ctrl X twice to abort...
Mon 02 Mar 1992 | Communications Link Active. | 00:00:32

When the transfer is completed, "Approximate Time Remaining" is replaced by "Press any key to continue." The event data just transferred is stored in a temporary file. When you disconnect the communication link you will be prompted to save this file to a location file.

Changing a 657's Site ID

To change a 657's site ID, select CHANGE 657 SITE ID from the Setups pull-down menu. The following screen will appear.

Change 657 Site ID Dialog Box

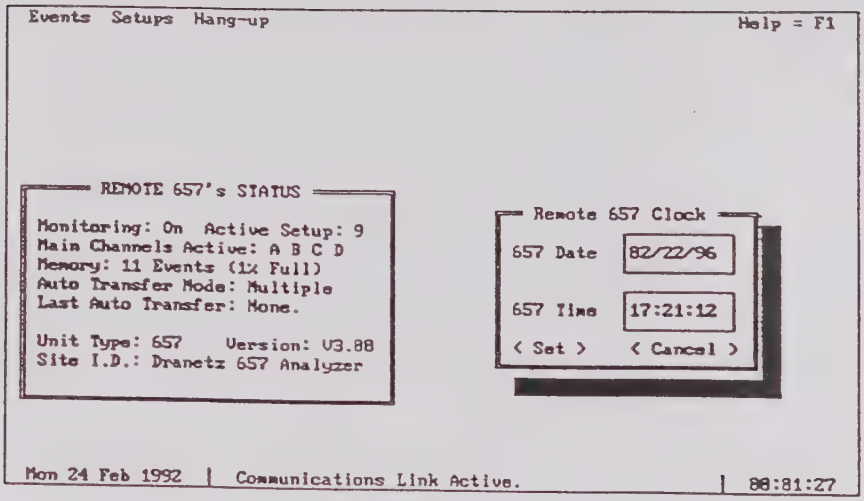


Up to 42 characters can be entered for the site I.D. When the I.D. is entered, select SET. The new I.D. will be displayed in the status box.

Changing a 657's Clock

To change the date or time for a 657, select SET 657 CLOCK from the Setups pull-down menu. The following screen will appear.

Set 657 Clock Dialog Box


Events Setups Hang-up
Help = F1
REMOTE 657's STATUS
Monitoring: On Active Setup: 9
Main Channels Active: A B C D
Memory: 11 Events (1% Full)
Auto Transfer Mode: Multiple
Last Auto Transfer: None.
Unit Type: 657 Version: V3.88
Site I.D.: Dranetz 657 Analyzer
Remote 657 Clock
657 Date 02/22/96
657 Time 17:21:12
< Set > < Cancel >
Mon 24 Feb 1992 | Communications Link Active. | 00:01:27

The date must be entered in MM/DD/YY format. Digits from 1 to 9 must be entered with a leading zero. For example, January 1, 1992 would be entered as 01/01/92.

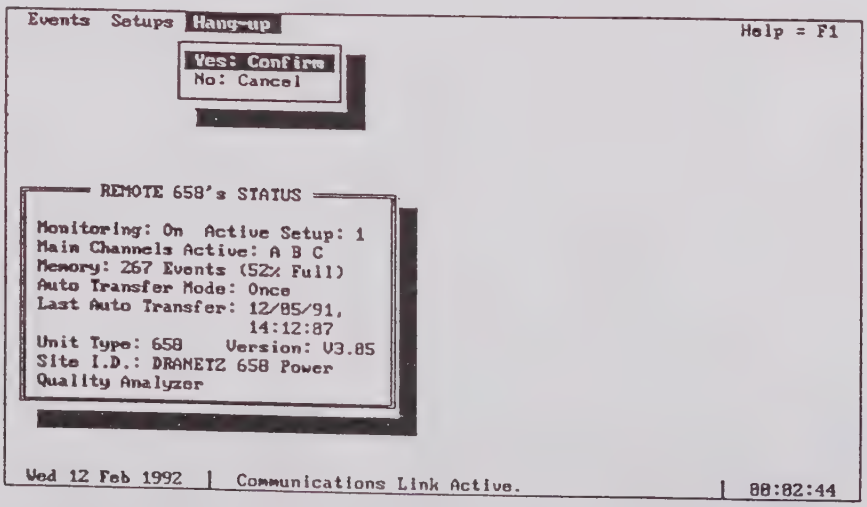
The time must be entered in hh:mm:ss, 24 hour format. Digits from 1 to 9 must be entered with a leading zero. For example, 9:05 AM must be entered as 09:05:00, and 9:05 PM must be entered as 21:05:00.

When the correct date and time are entered, select SET.

Disconnecting the Link

To disconnect the communications link, select HANG-UP then YES. The Hang-up pull-down menu is illustrated below.

Hang-up Pull-Down Menu


Events Setups Hang-up
Help = F1
Yes: Confirm
No: Cancel
REMOTE 658's STATUS
Monitoring: On Active Setup: 1
Main Channels Active: A B C
Memory: 267 Events (52% Full)
Auto Transfer Mode: Once
Last Auto Transfer: 12/05/91,
14:12:07
Unit Type: 658 Version: V3.05
Site I.D.: DRANETZ 658 Power
Quality Analyzer
Wed 12 Feb 1992 | Communications Link Active. | 00:02:44

If the communications link involves a modem, the analyzer terminates the link if there is no activity over the line for a period of five minutes. GHA displays a warning message 30 seconds before the link is terminated.

When the link is terminated, the following message appears on the screen: "Link Terminated. Press any key..."

NOTE

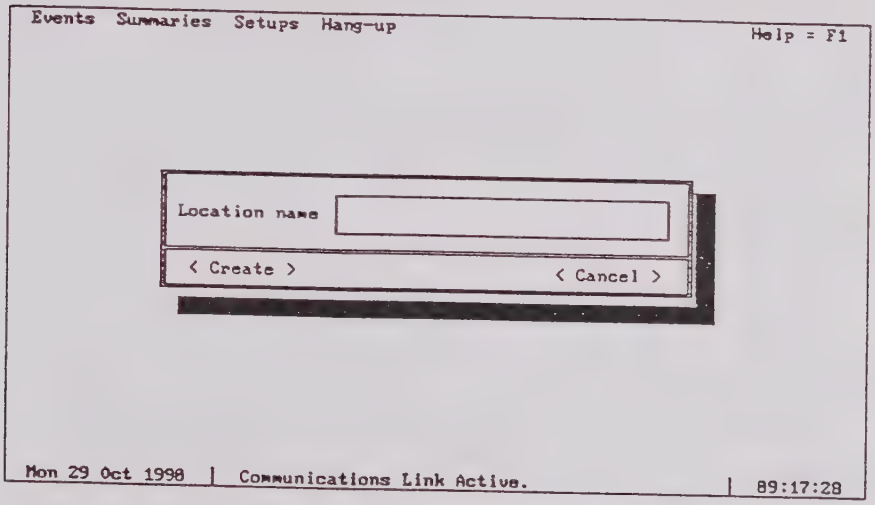
If analyzer data was retrieved during the communication link, a location file must be created to store the data.

Creating a Location File

If data from the analyzer's memory was retrieved during the communications link, a temporary file was created on the PC. The information in the temporary file is in a format the PC cannot understand or display. This data must be converted by GHA and stored in a location file.

When the communications link is terminated, a dialog box appears (as in the illustration below) prompting you for a name for the location file.

Location Name Dialog Box



A location name can consist of up to 42 characters. The <*Backspace*> key can be used to delete the previous keystroke(s) when typing a location file name. When finished typing in the name, select CREATE. GHA displays a running count of the events as they are converted.

When all the events have been converted and stored in the location file, a dialog box prompts you to press any key. Press a key and you are returned to the Main Menu. The newly created location file is now the active location file.

A date and a time are automatically added to the end of the file name in the locations list. The date and time are read from the analyzer's clock at the beginning of the data transfer. They may not correspond to the date and time displayed at the bottom of your screen. They can deviate considerably if you're communicating with an analyzer in a different time zone.

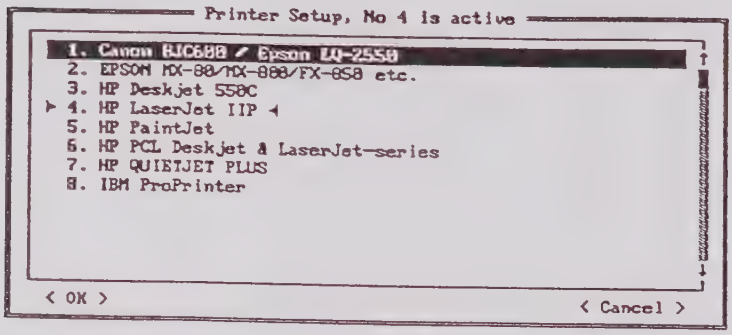
Each time GHA retrieves data from the analyzer, it creates a new location file. It does not write over any existing location files, even if they are the same. If data is transferred from the analyzer without clearing the memory, two or more location files may contain duplicate data.

Once the location file is created, data analysis functions can be performed on the data in the file. Turn to chapter 5 to learn the analysis functions and procedures.

If CANCEL is selected instead of CREATE, a warning message will appear, telling you that "Data in the temporary file will be lost." Select RETRY to create the location file. Selecting DISCARD DATA will cause the Main Menu to appear without creating a location file.

Printer Setup

Select Printer Setup from the Communications menu. The following screen will appear.


Printer Setup, No 4 is active
1. Canon BJC600 / Epson LQ-2550
2. EPSON MX-80/MX-800/FX-850 etc.
3. HP Deskjet 550C
4. HP LaserJet IIP
5. HP PaintJet
6. HP PCL Deskjet & LaserJet-series
7. HP QUIETJET PLUS
8. IBM ProPrinter
< OK >
< Cancel >

Use the mouse or up and down arrow keys to position the black bar over the desired printer, then select OK. The triangle at the right indicates the presently selected printer.

Refer to Appendix B for information on the necessary printer configuration for the HP Thinkjet.

CHAPTER 5
DATA ANALYSIS

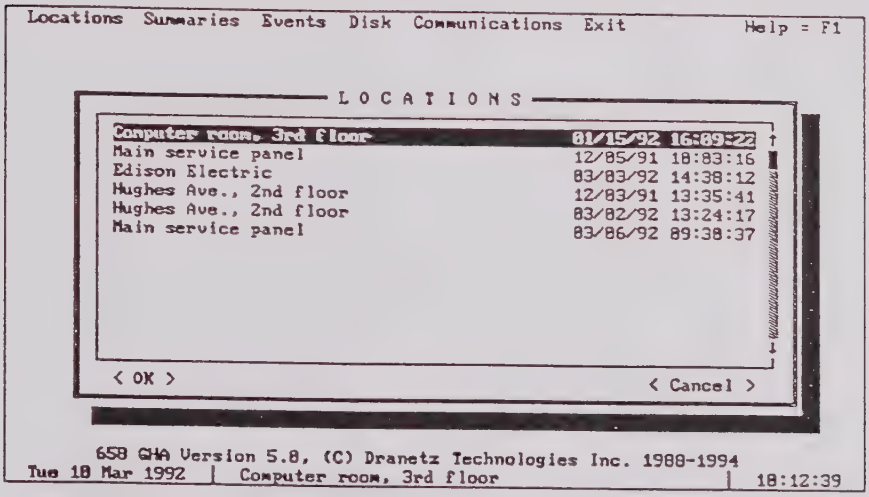
General Information

This chapter provides information on GHA's data analysis functions, including:

- Viewing graphic summaries.
- Viewing and understanding individual events.
- Performing a harmonic analysis on waveform events.

All data analysis functions are performed by selecting either the SUMMARIES or EVENTS options on the Main Menu. The data analysis is performed on the active location file. If there is no active location file when either of these two options is selected, a locations list appears (as illustrated below), prompting you to select an active location file.

Locations List


Locations Summaries Events Disk Communications Exit Help = F1
LOCATIONS
Computer room, 3rd floor 01/15/92 16:09:22
Main service panel 12/05/91 18:03:16
Edison Electric 03/03/92 14:38:12
Hughes Ave., 2nd floor 12/03/91 13:35:41
Hughes Ave., 2nd floor 03/02/92 13:24:17
Main service panel 03/06/92 09:38:37
< OK >
< Cancel >
658 GHA Version 5.0, (C) Dranetz Technologies Inc. 1988-1994
Tue 10 Mar 1992 | Computer room, 3rd floor | 10:12:39

Select a location file with the mouse or by pressing the up and down arrow keys to move the highlight. When the desired location file is highlighted, press *<Enter>*.

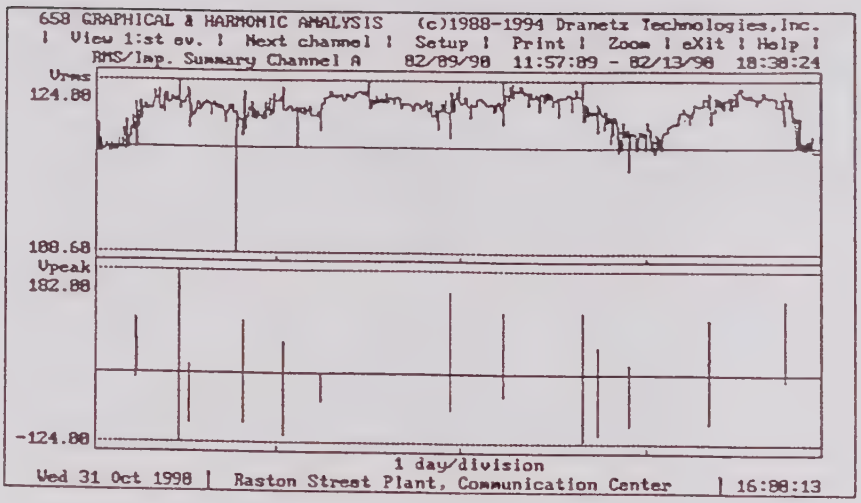
Graphics Screen

Once an active location file is selected, the options on the Summaries and Events pull-down menus (except CHANGE DEFAULT FREQUENCY) will cause a graphics screen to appear. A graphics screen is a screen that displays the data that was collected by an analyzer.

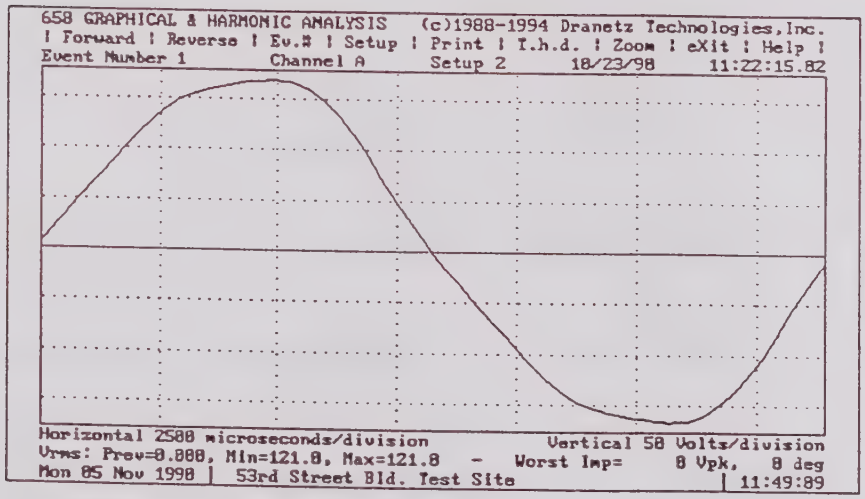
Types Of Graphics Screens

The two types of graphics screens are summary and event. They are illustrated on the next page.

Summary Screen


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| View 1:st ev. | Next channel | Setup | Print | Zoom | eXit | Help |
RMS/Imp. Summary Channel A 02/09/98 11:57:09 - 02/13/98 18:38:24
Vrms
124.00
100.60
Vpeak
102.00
-124.00
1 day/division
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 16:00:13

Event Screen


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 1 Channel A Setup 2 10/23/98 11:22:15.82
Horizontal 2500 microseconds/division Vertical 50 Volts/division
Vrms: Prev=0.000, Min=121.0, Max=121.0 - Worst Imp= 0 Vpk, 0 deg
Mon 05 Nov 1998 | 53rd Street Bld. Test Site | 11:49:09

The difference between the two screens is the second and third lines of text. The second line is the menu and the third line displays the type of summary, or the event number.

The area in the center of the screen that is enclosed in a box is called the display window.

Selecting Menu Options with the Keyboard

To select a menu option using the keyboard, press the letter key corresponding to the uppercase letter in the desired option. For example: press <*V*> for View first ev., <*N*> for Next channel, <*F*> for Forward, <*T*> for T.h.d., and <*X*> for eXit.

Selecting Menu Options with the Mouse

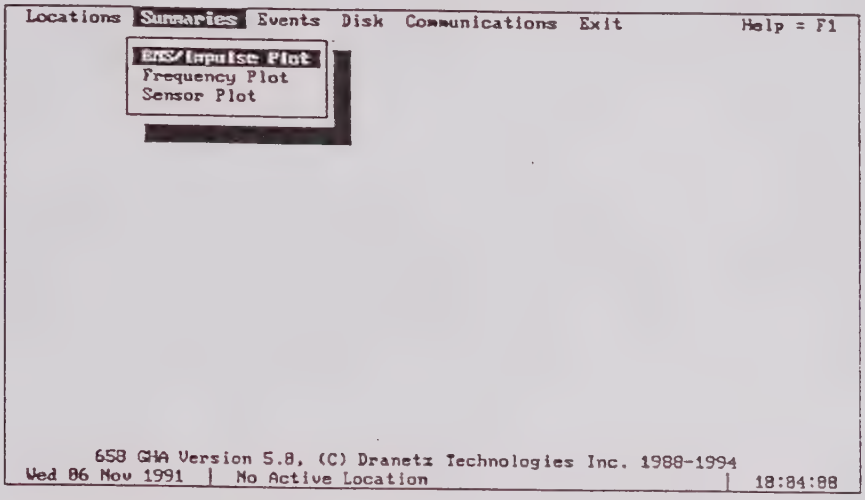
To select a menu option with the mouse, position the mouse cursor over the desired option and click the left mouse button. On graphics screens, the mouse cursor is in the shape of an arrow.

Viewing Graphic Summaries

A graphic summary is a time plot of a particular type of event recorded on a particular channel. When viewing graphic summaries, you can zoom in and plot a smaller interval of time, or you can choose to view individual events beginning with the first event displayed on the summary screen.

When SUMMARIES is selected from the Main Menu, the Summaries pull-down menu appears.

Summaries Pull-Down Menu



Types of Summaries

Three types of summaries can be plotted: RMS/Impulse Summaries, Frequency Summaries, and Sensor Channel Summaries.

For all three types of plots, the same menu options are displayed Below the menu, GHA displays the type of plot and the time span (beginning and ending date and time) of the data in the plot. The location file name appears on the bottom of the screen, along with the current date and time.

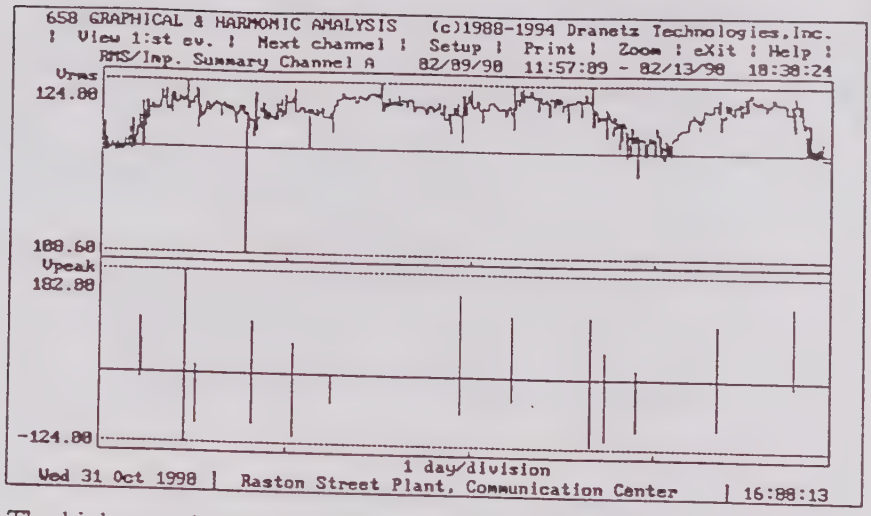
Directly below the display window, a line of text indicates the increments of time used to display the summary.

The increment can range from 1 month/division to 1 second/division, depending on the size of the plot and the level of display magnification chosen with the ZOOM option.

RMS/Impulse Summaries

When this option is selected, two summaries appear on the screen. The upper summary plots current or voltage RMS values. The lower summary plots transient disturbances. An example is illustrated on the next page.

RMS/Impulse Summary


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| View 1:st ev. | Next channel | Setup | Print | Zoom | eXit | Help |
RMS/Imp. Summary Channel A 02/09/98 11:57:09 - 02/13/98 18:38:24
Urms
124.00
108.60
Upeak
102.00
-124.00
1 day/division
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 16:08:13

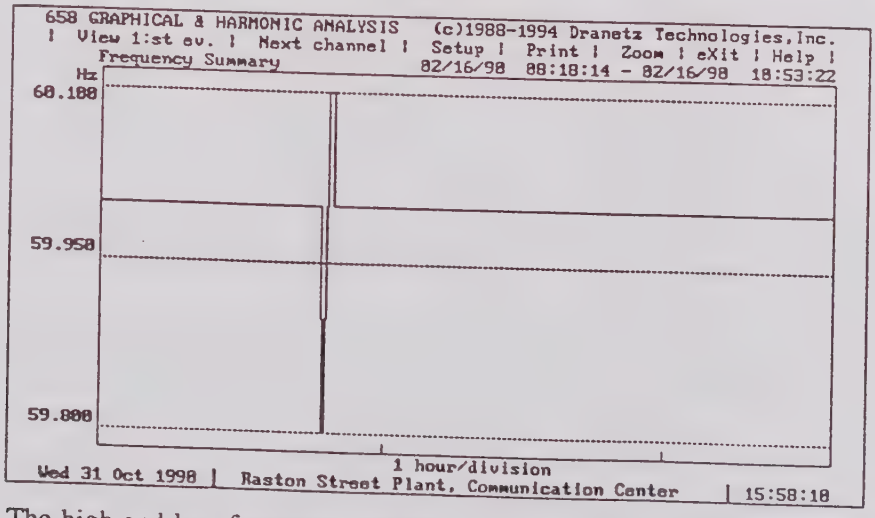
The highest and lowest RMS values are indicated in the upper plot with coarse dotted lines. The highest and lowest impulse values are indicated in the same way on the lower plot. The numerical value of these lines is displayed to the left of the plot.

If the high or low limits have been exceeded during the monitoring period, the RMS plot displays the limit(s) exceeded with a fine dotted line.

Frequency Summaries

This type of summary plots changes in the synchronization channel's frequency. An example is illustrated below.

Frequency Summary


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| View 1:st ev. | Next channel | Setup | Print | Zoom | eXit | Help |
Frequency Summary 02/16/98 08:18:14 - 02/16/98 18:53:22
Hz
60.100
59.950
59.800
1 hour/division
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:58:10

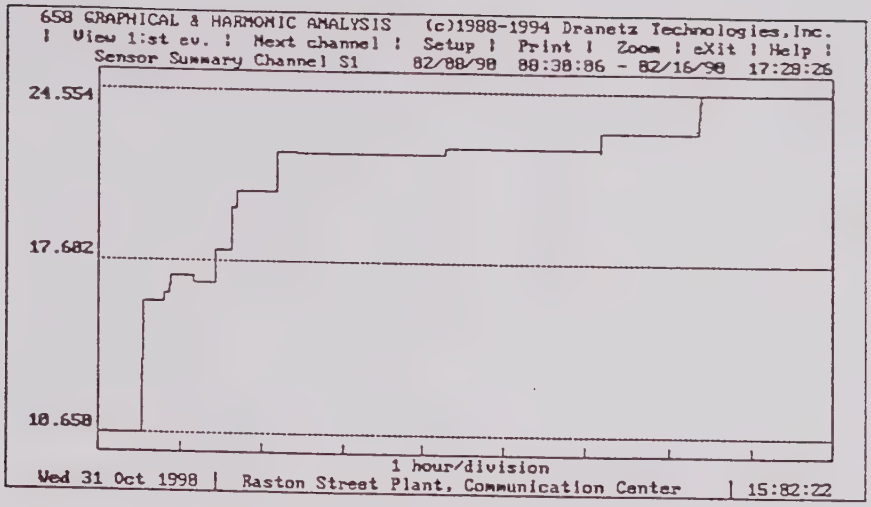
The high and low frequency values are indicated by coarse dotted lines. The numerical values of these lines are displayed to the left of the plot.

Sensor Channel Summaries

This type of summary plots data recorded using the analyzer's optional sensors (transducer board). As shown in the following example.

The high, low and median unit values in the plot are indicated by coarse dotted lines. The numerical values of these lines are displayed to the left of the plot.

Sensor Channel Summary


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| View 1:st ev. | Next channel | Setup | Print | Zoom | eXit | Help |
Sensor Summary Channel S1 02/08/98 08:38:06 - 02/16/98 17:28:26
24.554
17.682
10.658
1 hour/division
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:02:22

Menu Options

The options displayed on the menu are the same for each of the three types of graphic summaries. These options are: VIEW 1:ST EV., NEXT CHANNEL, SETUP, PRINT, ZOOM, EXIT, and HELP.

View 1:st Ev.

When this option is selected from the Graphics Screen Menu, the first recorded event, in the time plot on the screen, is displayed. This event is always of the same type and channel as the summary regardless of what other events in the location file occurred during that time span. For example, it would be a frequency event if you had been viewing a frequency time plot.

If the zoom markers (from the ZOOM option) are on the screen when VIEW 1:ST EV. is selected, the first event found between the zoom markers (vertical dashed lines) is considered the first event.

From this event you can page forward or backward through all the events in the file, or jump to any particular event by selecting the EV # option.

For more information on viewing individual events, refer to the "Viewing Events" section of this chapter.

Next Channel

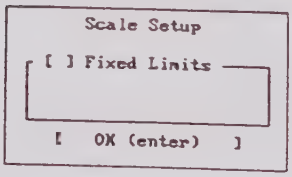
When viewing RMS/Impulse and Sensor Channel Summaries, all the data in the plot was recorded on the same channel on the analyzer. To view the same type of event data recorded on a different channel, select NEXT CHANNEL. The new graphic summary displayed covers the same time span as the previous one. If only one channel was used by the analyzer during that time span, the display does not change.

This option sequentially changes the display to the next available channel (of that type of event) each time it is selected. The first channel in the sequence is displayed again after the last one.

This option is not used for frequency plots, since the frequency is only recorded on one channel.

Setup

The vertical scale for the graphic summaries are automatically set to the highest and lowest values available. When you select this option, the following dialog box appears, allowing you to change the vertical scale.



Press <*F*> to display the present values for the high and low limits. Press <*H*>, enter a value for the high limit and press <*Enter*>. Press <*L*>, enter a value for the low limit and press <*Enter*>. Press <*Enter*> again to accept the new limits.

Print

The Dranetz 658 Graphical and Harmonic Analysis software is designed to work with Epson, IBM, and Hewlett Packard printers. Refer to Chapter 4 for information about selecting a printer.

The print option works the same way for all the graphic screens. including the graphic summary screens, event screens, and harmonic analysis screens. The image on the screen is printed in its entirety, with the exception of the menu, which is replaced with the location file name.

The screen's image can be sent directly to the printer for a hard copy, or it can be sent to a file on the PC's hard disk. This file can be printed out later through DOS, or loaded into a third party software package, such as PC Paintbrush. These programs allow you to modify and enhance screen images for integration into finished reports.

Hard copy

To print out a hard copy of the image, first select PRINT from the menu bar. The menu bar on the screen is then replaced with the printing options.

Press <*Enter*> to print out the screen image. To cancel the print process, press <*Esc*>.

Disk file

When printed to a file, the screen's image is saved in .PCX format.

To print the image to the hard disk, first select PRINT from the menu bar. The menu bar on the screen is then replaced with the print options.

The following prompt appears on the bottom line:

Destination: [Enter]=Printer, [B]=B/W PCX file, [C]=Color PCX file

Press the B or C for the desired mode. You are then prompted for a file name.

Enter File Name:

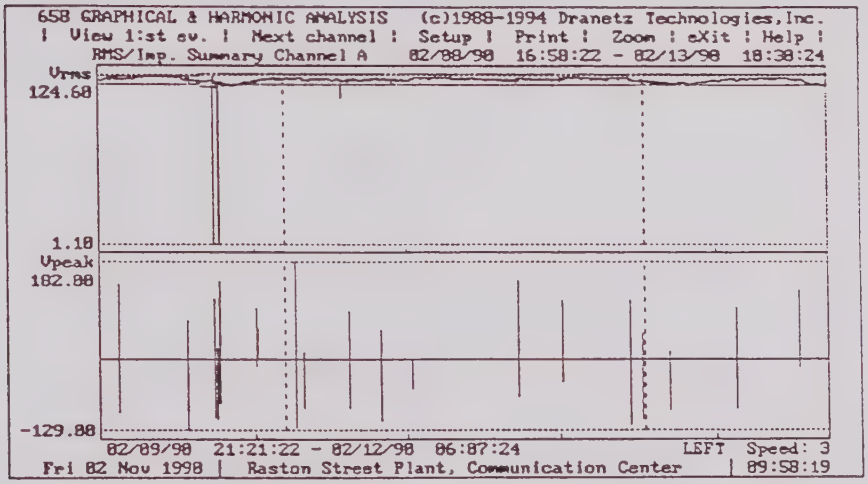
Type a file name in standard DOS format (up to 8 characters. no punctuation marks or spaces). Press <*Enter*>. The screen image is saved to a file in the same directory in which the software is running.

Zoom

The ZOOM option allows you to narrow the time span that is plotted for a particular graphic summary. You can zoom in up to 20 times. or down to a period as small as 5 seconds.

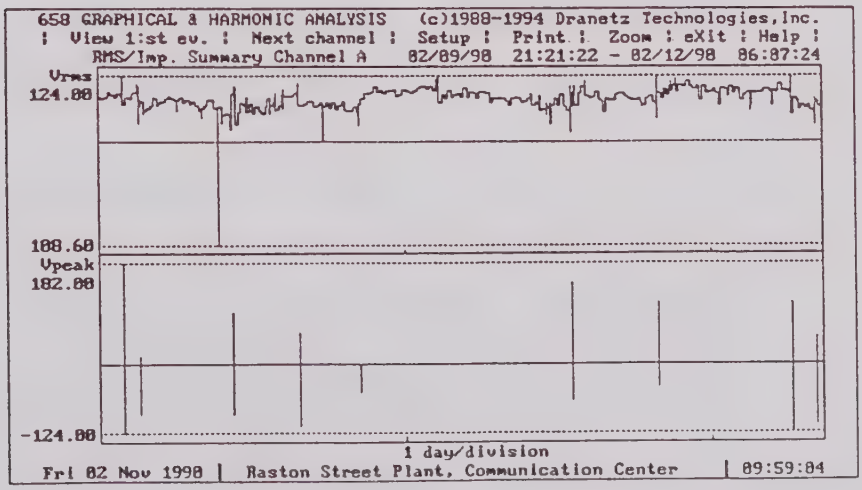
When ZOOM is selected from the menu bar, two vertical dotted lines appear across the graph, as in the illustration below. The time span bounded by these markers is indicated below the graph.

RMS/Impulse Summary Screen With Zoom Markers


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| View 1:st ev. | Next channel | Setup | Print | Zoom | eXit | Help |
RMS/Imp. Summary Channel A 02/08/98 16:58:22 - 02/13/98 18:38:24
Vrms
124.68
1.10
Vpeak
182.88
-129.88
02/09/98 21:21:22 - 02/12/98 06:87:24 LEFT Speed: 3
Fri 02 Nov 1998 | Raston Street Plant, Communication Center | 09:58:19

When ZOOM is selected a second time, the area between the zoom markers is expanded to fill the complete plot window (as in the illustration below).

Zoomed Plot


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| View 1:st ev. | Next channel | Setup | Print | Zoom | eXit | Help |
RMS/Imp. Summary Channel A 02/09/98 21:21:22 - 02/12/98 06:87:24
Vrms
124.88
188.68
Vpeak
182.88
-124.88
1 day/division
Fri 02 Nov 1998 | Raston Street Plant, Communication Center | 09:59:04

The zoom markers can be moved to select a different area of the plot for expansion. This can be done using the keyboard or the mouse.

With the Keyboard

The bottom right hand corner of the screen indicates which zoom-marker is the active one (right or left). To change this, press the space bar.

Use the right and left arrow keys to move the active zoom-marker. The distance the marker moves is determined by the speed, indicated in the lower right hand corner of the screen. (A lower number indicates a slower speed.) To change the speed, press a numeric key from the top row of the keyboard (1 to 9).

With the Mouse

When Zoom is selected, the mouse cursor changes to a square (called a grab box), whenever it is moved into the display window. Position the grab box over the zoom marker to be moved and click the left mouse button. The grab box changes to an aiming cross-hair. Move the cross-hair to the desired location and click the left mouse button again. The zoom marker jumps to this new location.

Zooming Out

To return to the previous zoom level, select *<Esc>*. To return to the original plot (complete time span) and skip over the previous zoom levels. select EXIT from the menu bar.

Clicking the right mouse button also zooms out one level at a time.

Quick Zoom

A quick zoom feature that bypasses the menu Zoom command is available. With the plot displayed, place the mouse cursor at the position of the desired zoom box and click the left mouse button. Then move the cursor diagonally to draw a box around the desired area. Click the left button again to zoom in on the area just drawn.

Click the right button to return to the previous zoom level.

Exit

If you're viewing a zoomed plot, EXIT returns you to the original (complete) plot. If viewing the original plot, EXIT returns you to the Main Menu.

Help

This option displays a brief description of the other options on the menu bar.

Viewing Events

Individual events can be viewed with one of two options:

- the EVENTS option on the Main Menu
- the VIEW 1:ST EV. option on a summary plot.

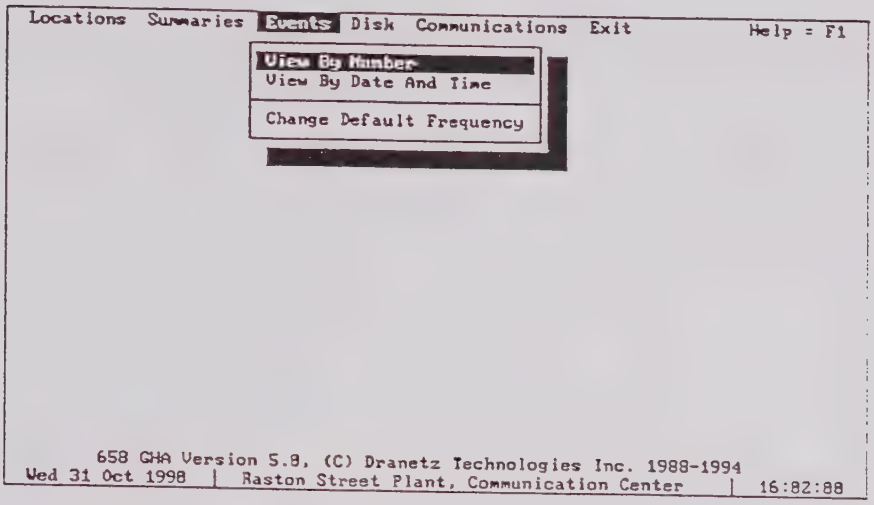
The only difference, once viewing individual events, is where you return when you select EXIT from the Event Screen Menu.

- If viewing events with the EVENTS option on the Main Menu, you are returned to the Main Menu.
- If viewing events with the VIEW 1:ST EV. option on a summary plot, you are returned to the graphic screen previously displayed.

The VIEW 1:ST EV. option is discussed in the "Viewing Graphic Summaries" section of this chapter. The EVENTS option is discussed below.

When EVENTS is selected from the Main Menu, the Events pull-down menu appears (illustrated on the following page).

Events Pull-Down Menu


Locations Summaries Events Disk Communications Exit Help = F1
View By Number
View By Date And Time
Change Default Frequency
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 16:02:08

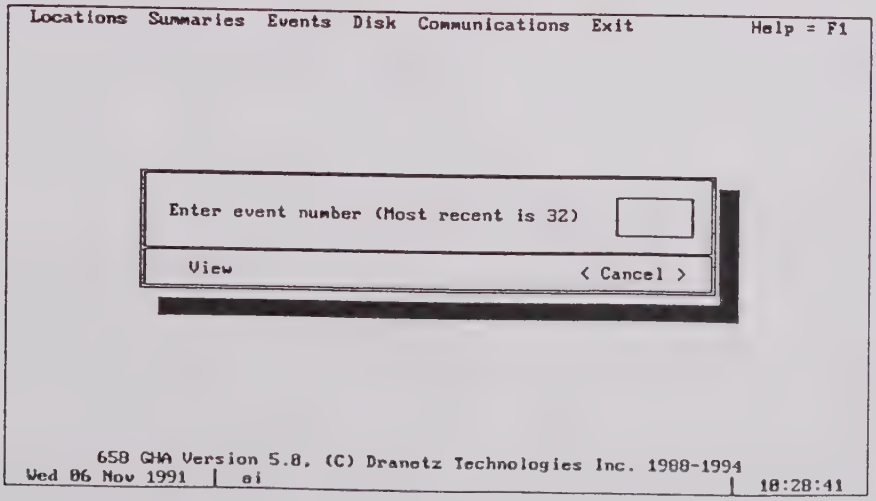
The first two options, VIEW BY NUMBER and VIEW BY DATE AND TIME, allow you to choose a specific point in the file to begin viewing events.

The third option, CHANGE DEFAULT FREQUENCY, allows you to change the default frequency used in harmonic analysis. This option is discussed in the "Harmonic Analysis" section of this chapter.

View by Number

When VIEW BY NUMBER is selected, a dialog box appears on the screen, displaying the total number of events (most recent event number) in the file, and prompting for the number of the event to be viewed. This dialog box is illustrated below.

View By Number Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Enter event number (Most recent is 32)
View
< Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 06 Nov 1991 | ei | 10:28:41

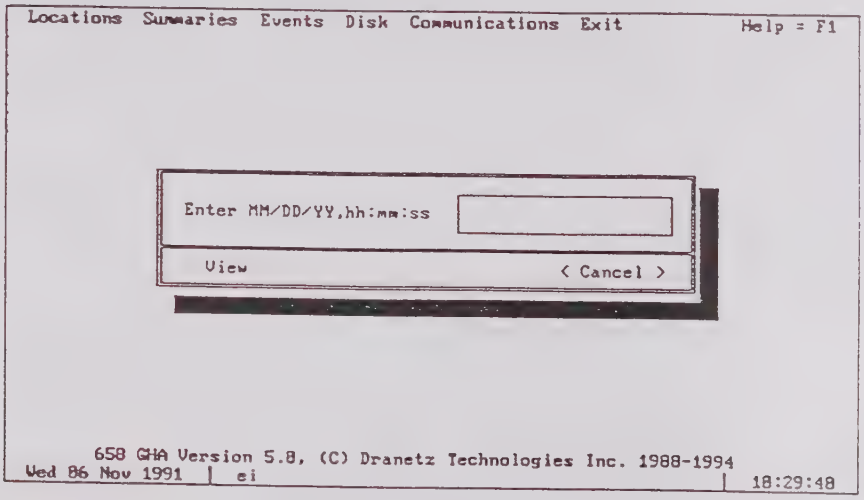
Enter an event number. Select VIEW to display the event; select CANCEL to return to the Main Menu.

If you select VIEW without entering an event number, the most recent event is displayed.

View by Date and Time

When VIEW BY DATE AND TIME is selected, a dialog box appears on the screen, prompting for the date and time of the event to be viewed. This dialog box is illustrated below.

View By Date and Time Dialog Box


Locations Summaries Events Disk Communications Exit Help = F1
Enter MM/DD/YY,hh:mm:ss
View
< Cancel >
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 06 Nov 1991 | ei | 18:29:48

Enter the date and time the event occurred. Select VIEW to display the event; select CANCEL to return to the Main Menu.

The event displayed is the *last* event occurring before the time you select. If you enter a date and time earlier than the first event in the file, an error message appears. If you enter a date and time after the last event in the file, the last event in the file is displayed.

If you enter a date only, the last event occurring before that date is printed. If there are no events prior to that date, an error message appears.

If you enter a time only, an error message appears.

Event Types

The types of events that can be contained in the location file depend on the configuration of the analyzer that the file was obtained from. The different types of events that the analyzer can record are described on the following pages. (Consult your analyzer Operator's Manual for more information on monitoring events and event types.)

The menu bar is the same for all types of events, although ZOOM and T.H.D. can only be performed on waveform events. The text line below the menu bar indicates the event's position in memory (Event Number), the channel the event was recorded on, the number of the monitoring setup in effect when the event occurred, and the time and date the disturbance occurred.

Initial Events

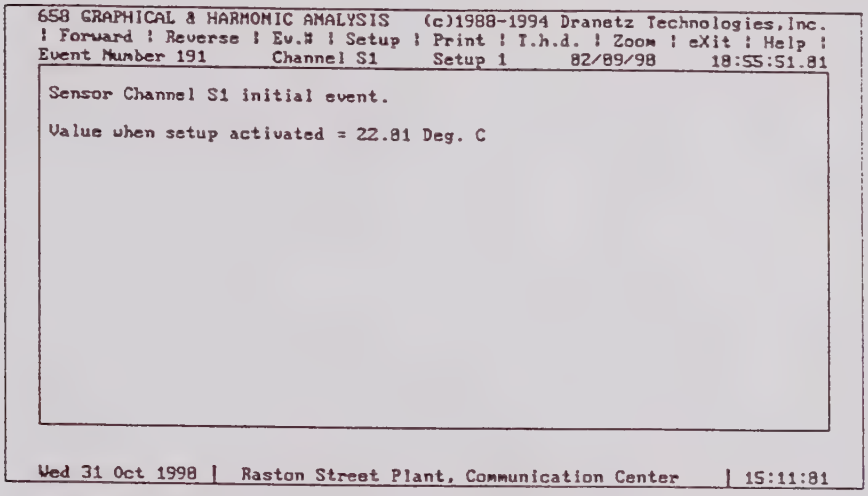
When the analyzer is powered on, a reference reading is taken of:

- the active Sensor Channel values,
- the active Main Channel waveforms,
- the active Main Channel RMS values,
- the frequency value.

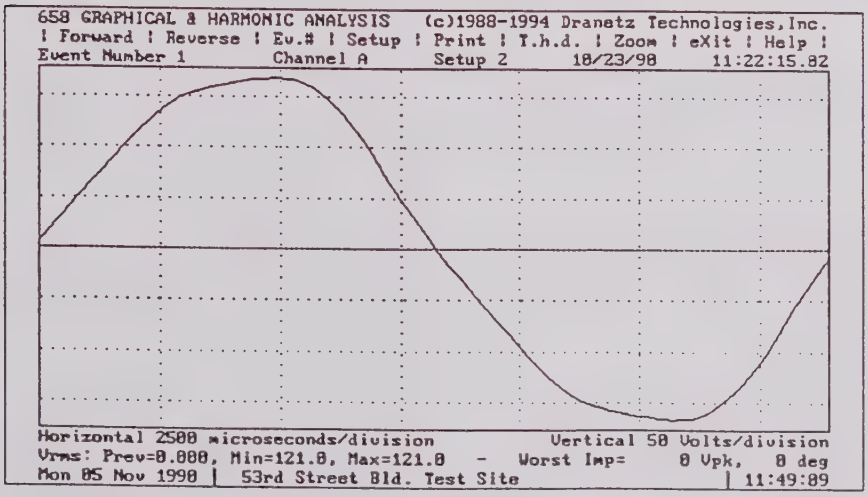
These readings, or initial events, are also recorded when monitoring is turned on or whenever a new setup is activated.

Examples of these events are displayed below and on the following pages:

Initial Sensor Channel Event

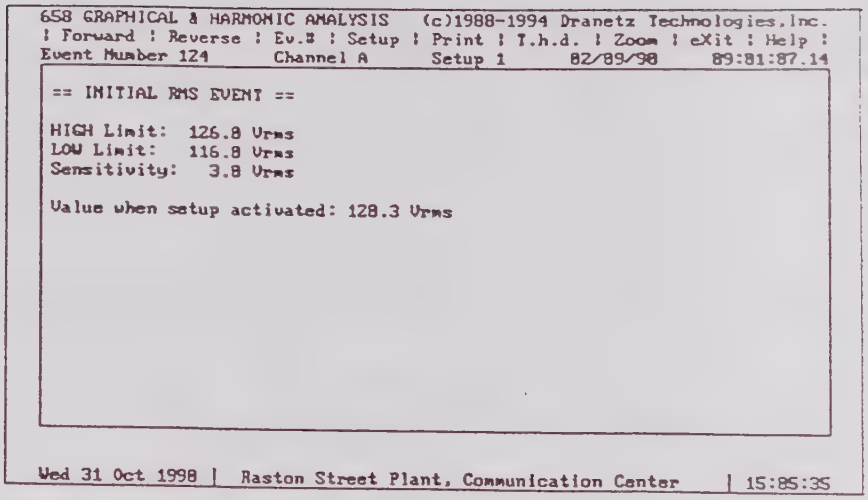

658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 191 Channel S1 Setup 1 02/09/98 18:55:51.81
Sensor Channel S1 initial event.
Value when setup activated = 22.81 Deg. C
Wed 31 Oct 1990 | Raston Street Plant, Communication Center | 15:11:81

Initial Waveform Event

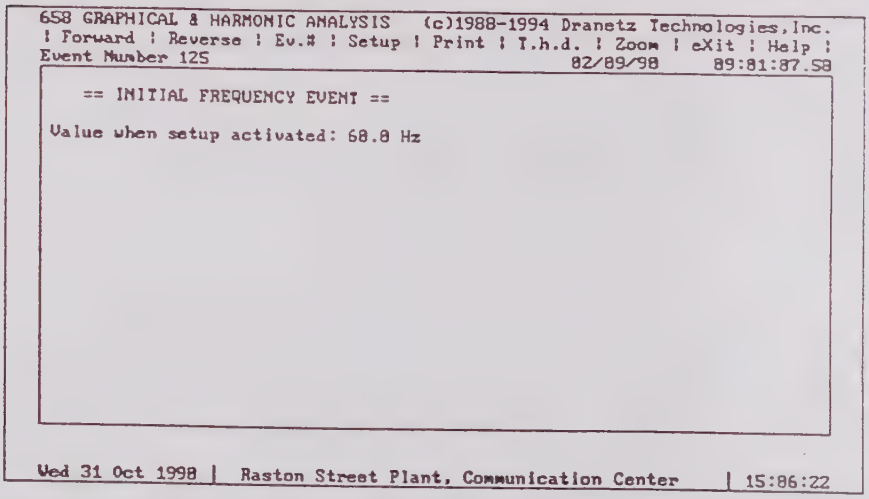

658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 1 Channel A Setup 2 10/23/98 11:22:15.82
Horizontal 2500 microseconds/division Vertical 50 Volts/division
Vrms: Prev=0.000, Min=121.0, Max=121.0 - Worst Imp= 0 Vpk, 0 deg
Mon 05 Nov 1990 | 53rd Street Bld. Test Site | 11:49:09

One waveform event can consist of up to four screens, one for each active channel. Waveform events are discussed in detail later in this section.

Initial RMS Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 124 Channel A Setup 1 02/09/98 09:01:07.14
== INITIAL RMS EVENT ==
HIGH Limit: 126.8 Vrms
LOW Limit: 116.8 Vrms
Sensitivity: 3.8 Vrms
Value when setup activated: 128.3 Vrms
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:05:35

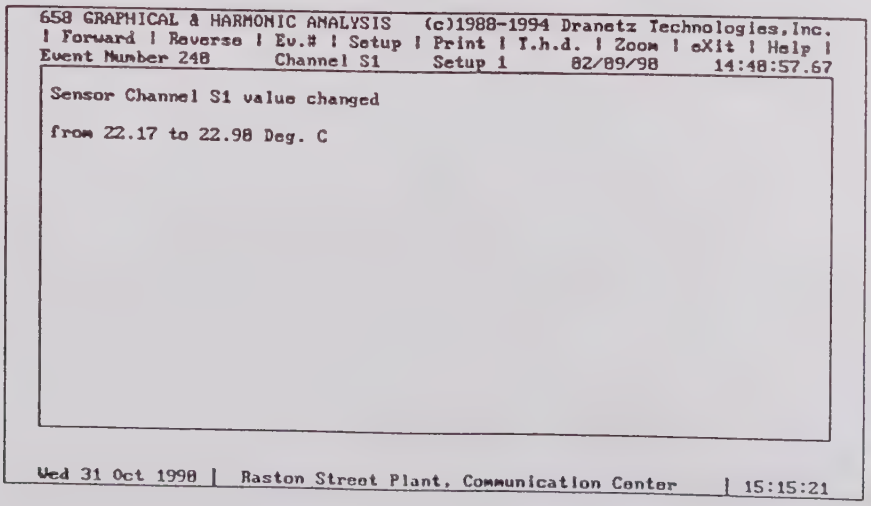
Initial Frequency Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 125 02/09/98 09:01:07.58
== INITIAL FREQUENCY EVENT ==
Value when setup activated: 60.0 Hz
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:06:22

Sensor Channel Events

When a monitored Sensor Channel changes by more than the user specified sensitivity from the previously recorded event for that channel, a new event is recorded. This new event then becomes the reference for the next event. Below is a sample Sensor Channel Event.

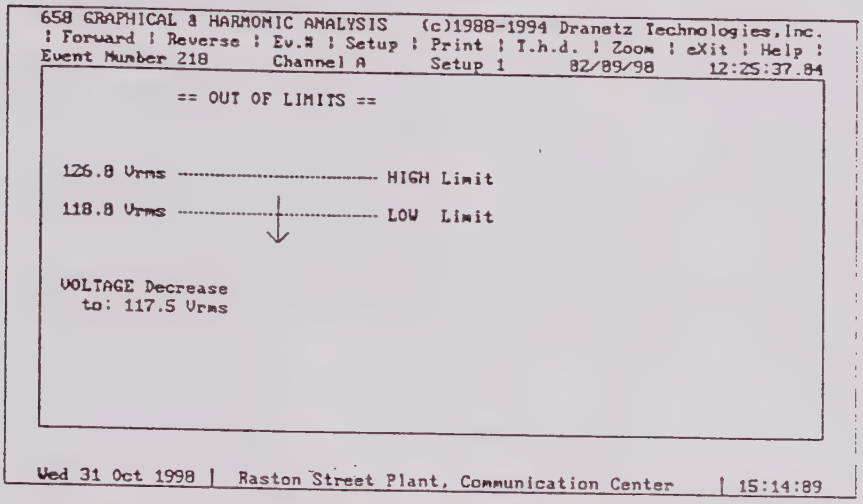
Sensor Channel Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 248 Channel S1 Setup 1 02/09/98 14:48:57.67
Sensor Channel S1 value changed
from 22.17 to 22.98 Deg. C
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:15:21

Data reported by an RMS event may overlap with data reported by a waveform event: a sag in voltage, for example, may be recorded as both a waveform event and a simultaneous RMS event. This depends on the threshold settings for these two parameters.

The out-of-limits event illustrated below was recorded when the Voltage RMS went below the user set low limit of 118 volts.

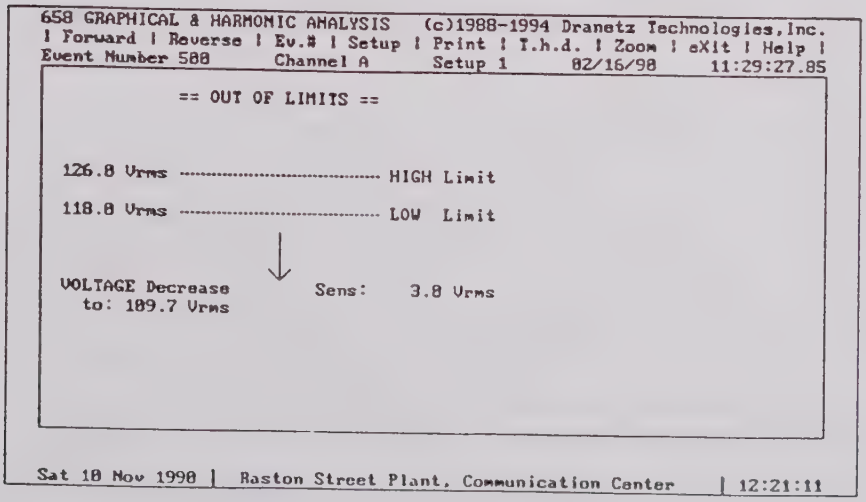
RMS Dropping Below User Set Lower Limit


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
! Forward ! Reverse ! Ev.# ! Setup ! Print ! T.h.d. ! Zoom ! eXit ! Help !
Event Number 218 Channel A Setup 1 02/09/98 12:25:37.84
== OUT OF LIMITS ==
126.8 Vrms ---------- HIGH Limit
118.8 Vrms ---------- LOW Limit
VOLTAGE Decrease
to: 117.5 Vrms
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:14:09

The middle of the screen displays the values of the high and low limits at the time the event occurred. The direction of the arrow on the screen illustrated above indicates that the RMS value decreased. The fact that the arrow crosses the lower line indicates that this value had previously been within the acceptable limits. The lower left hand corner of the display window indicates the new RMS value.

In the illustration below, the arrow indicates that the RMS value decreased by more than the user set sensitivity while out-of-limits. This sensitivity value is displayed in the lower right portion of the screen. As in the illustration above, the lower left hand corner of the display window indicates new RMS value.

RMS Changing By More Than User Specified Amount While Out Of Limits


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
! Forward ! Reverse ! Ev.# ! Setup ! Print ! T.h.d. ! Zoom ! eXit ! Help !
Event Number 588 Channel A Setup 1 02/16/98 11:29:27.85
== OUT OF LIMITS ==
126.8 Vrms ---------- HIGH Limit
118.8 Vrms ---------- LOW Limit
VOLTAGE Decrease
to: 109.7 Vrms
Sens: 3.8 Vrms
Sat 18 Nov 1998 | Raston Street Plant, Communication Center | 12:21:11

Waveform Events

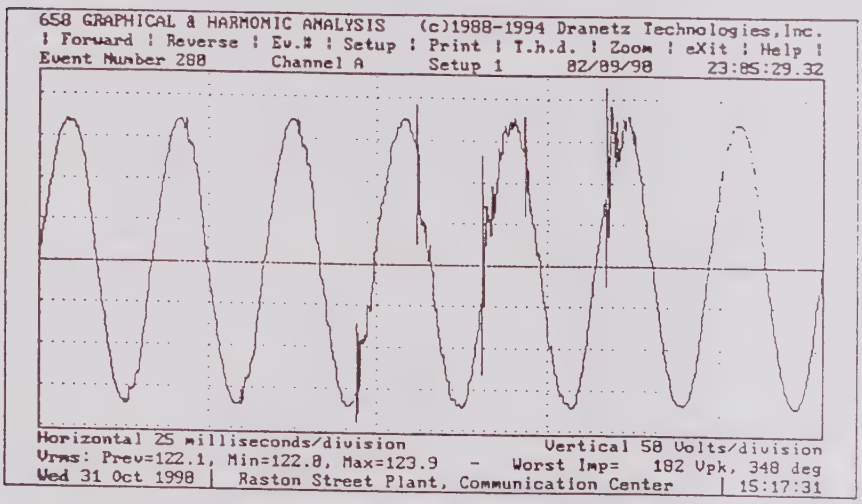
A waveform event is recorded whenever the waveshape varies by more than the programmed sensitivity from the last cycle of the last event on a given channel.

Waveform events are also recorded when the analyzer detects transients (impulses) of magnitude greater than the user-programmed impulse threshold.

Waveform events can consist of a single cycle or multiple cycles.

The sample waveform event illustrated below is a multi-cycle impulse event. (If monitoring current instead of voltage, "Arms" and "Apeak" would appear instead of "Vrms" and "Vpeak."

Waveform Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 288 Channel A Setup 1 02/09/98 23:05:29.32
Horizontal 25 milliseconds/division Vertical 50 Volts/division
Vrms: Prev=122.1, Min=122.0, Max=123.9 - Worst Imp= 182 Vpk, 348 deg
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:17:31

The text line immediately below the display window displays the values for the divisions used for the grid on the graph. The next line indicates the RMS value before this event occurred, the minimum and maximum RMS values reached during the event, and the amplitude of the worst impulse in the displayed event. Min and Max values are identical in one-cycle events.

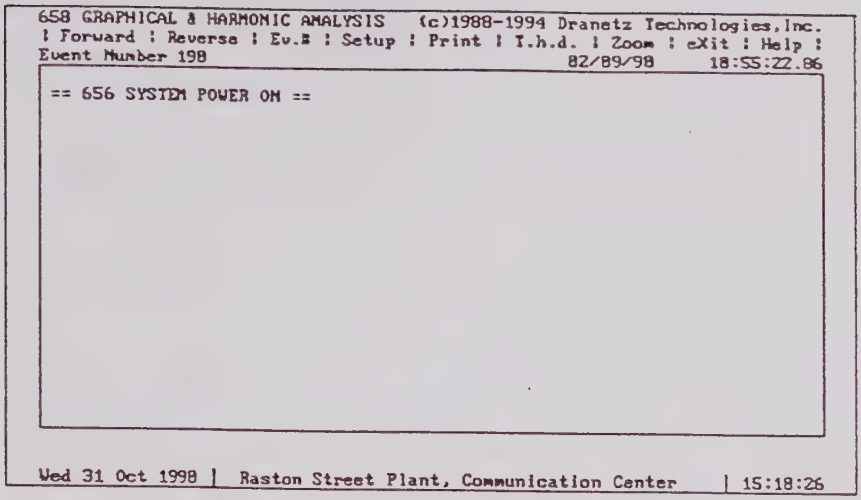
A waveform event is recorded for all active Main Channels whenever one channel is triggered. Therefore, one waveform event can consist of up to four screens, one for each active Main Channel.

Out-of-Limits Events

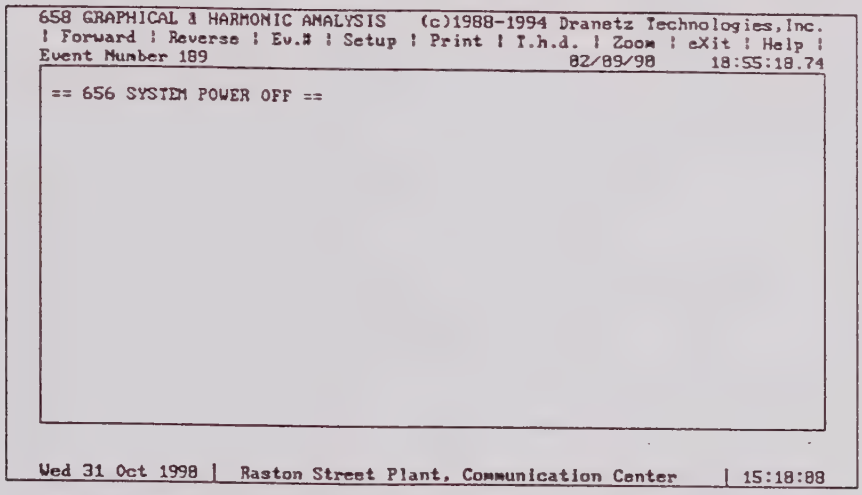
An out-of-limits event occurs when the RMS value of any monitored channel goes above or below the user set limits for one cycle or longer. Once out of these limits, a new event is recorded each time the RMS value increases or decreases from the previously recorded RMS value by more than the specified sensitivity. A normal event is also recorded when the RMS value returns to within the specified limits.

RMS events are recorded only for the channel which goes out of limits: an RMS event on one Main Channel does not trigger an event on any other Main Channel.

Power ON Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 198
02/09/98 18:55:22.86
== 656 SYSTEM POWER ON ==
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:18:26

Power OFF Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 189
02/09/98 18:55:18.74
== 656 SYSTEM POWER OFF ==
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:18:88

Pseudo RMS Event

A pseudo event is an RMS event collected by an analyzer by sampling the input channels at 15 minute intervals. It is only collected when the RMS value is within limits. Pseudo events are used primarily to fill in the spaces between disturbance events on the RMS/Impulse Summary. A pseudo event is not viewable as a disturbance event.

Menu Options

The options displayed in the menu bar are the same for all types of events. These options are: FORWARD, REVERSE, EV #, SETUP, PRINT, T.H.D., ZOOM, EXIT, and HELP.

All the events in the location file are in chronological order. They are assigned a sequential event number by the analyzer as they occur.

Forward

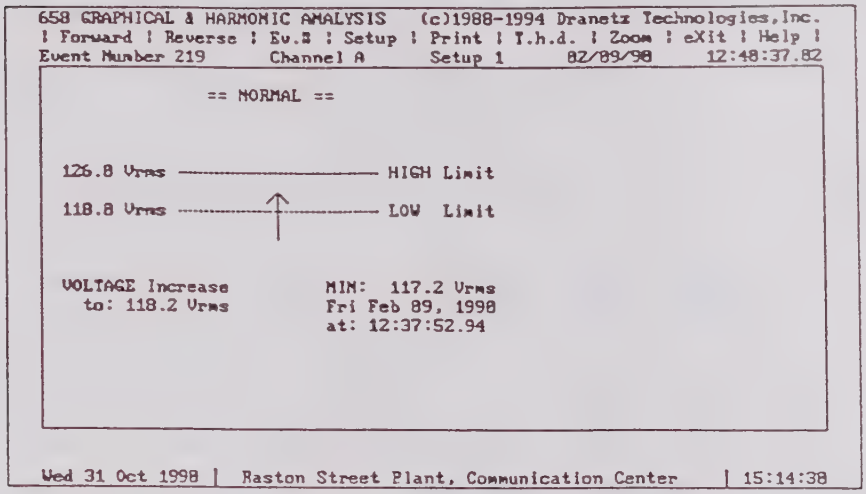
This option and the REVERSE option allow you to sequentially page through all the events in the file. Select FORWARD to display the next event.

Reverse

This option and the FORWARD option allow you to sequentially page through all the events in the file. Select REVERSE to display the previous event.

The arrow in the illustration below indicates that the RMS value returned to within the user set limits. The minimum value recorded while out of limits is displayed in the lower right portion of the display window along with the time and date that it occurred.

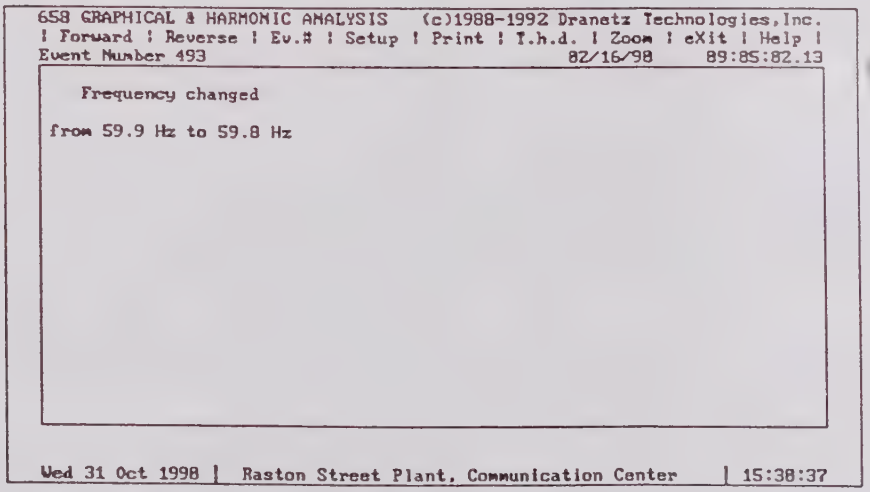
RMS Returning Above User Set Lower Limit


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
Forward Reverse Ev.# Setup Print T.h.d. Zoom eXit Help
Event Number 219 Channel A Setup 1 02/09/98 12:48:37.82
== NORMAL ==
126.8 Vrms HIGH Limit
118.8 Vrms LOW Limit
VOLTAGE Increase to: 118.2 Vrms
MIN: 117.2 Vrms
Fri Feb 09, 1998
at: 12:37:52.94
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:14:38

Frequency Events

A frequency event is recorded when the frequency changes by more than the user set sensitivity from the previously recorded frequency event. This event then becomes the reference for the next frequency event. An example frequency event is illustrated below.

Frequency Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1992 Dranetz Technologies,Inc.
Forward Reverse Ev.# Setup Print T.h.d. Zoom eXit Help
Event Number 493 02/16/98 09:05:02.13
Frequency changed
from 59.9 Hz to 59.8 Hz
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 15:38:37

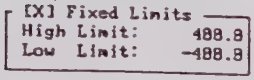
Power ON/Off Events

A Power ON event is recorded when the unit is turned on or when power being supplied to the unit is restored after an extended outage (UPS battery depleted).

A Power OFF event is recorded when the analyzer is turned off or when power being supplied to the unit is lost and the battery in the UPS has been exhausted.

Fixed Limits

This option allows you to set the voltage amplitude viewing limits.



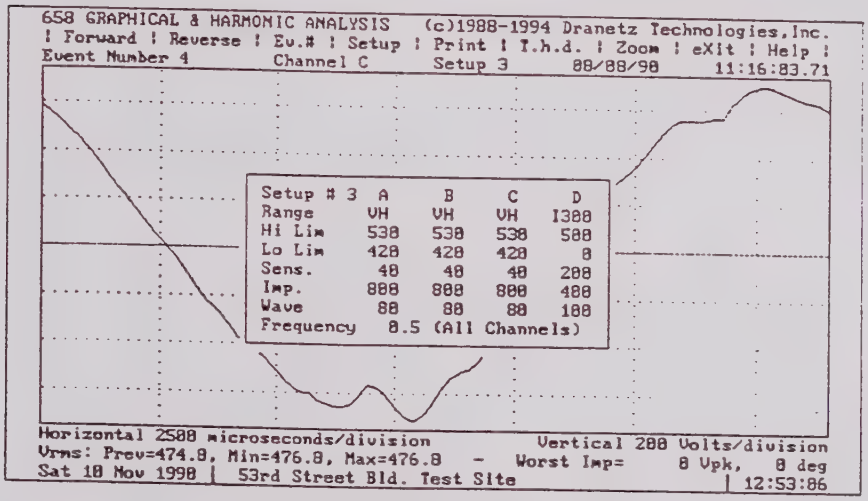
Enter the desired limits and select OK.

View Event Setup

This option displays the analyzer's threshold settings for channels A. B. C, and D at the time the displayed event was recorded. If optional sensors are used, the display shows settings for the sensor channels.

An example Event Setup dialog box display is illustrated below.

Event Setup Dialog Box


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help
Event Number 4 Channel C Setup 3 08/08/98 11:16:83.71
Setup # 3 A B C D
Range VH VH VH I300
Hi Lim 530 530 530 500
Lo Lim 420 420 420 0
Sens. 40 40 40 200
Imp. 800 800 800 400
Wave 80 80 80 100
Frequency 8.5 (All Channels)
Horizontal 2500 microseconds/division Vertical 200 Volts/division
Vrms: Prev=474.9, Min=476.8, Max=476.8 - Worst Imp= 0 Vpk, 0 deg
Sat 10 Nov 1998 | 53rd Street Bld. Test Site | 12:53:86

To remove the setups display from the screen, select EXIT from the menu.

Print

This option works the same as the PRINT option described in the "Viewing Graphic Summaries" section of this chapter.

T.h.d.

This option computes and graphically displays the harmonic distortion of any one-cycle period in a waveform event. This option is discussed in detail in the "Harmonic Analysis" section of this chapter.

This option is only active for waveform events.

Zoom

This selection is only used on waveform events. The zoom feature allows you to expand and redraw any portion of the waveform.

Ev #

To jump to a particular event without paging through a series of events, select Ev #. The following prompt replaces the menu bar on the screen:

Enter Event Number (Default: XXX):

The default is the number of the last event in the file.

Type in the number of the event you wish to view and press <*Enter*>. If there is more than one screen in the event (as is possible with waveform events), the screen containing the first channel for the event is the one displayed.

Setup

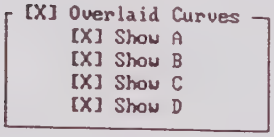
This option allows you to select one of the following options.

- Select Overlaid Curves.
- Fixed Limits.
- Display Event Setup.

The first two options are available for waveform events only.

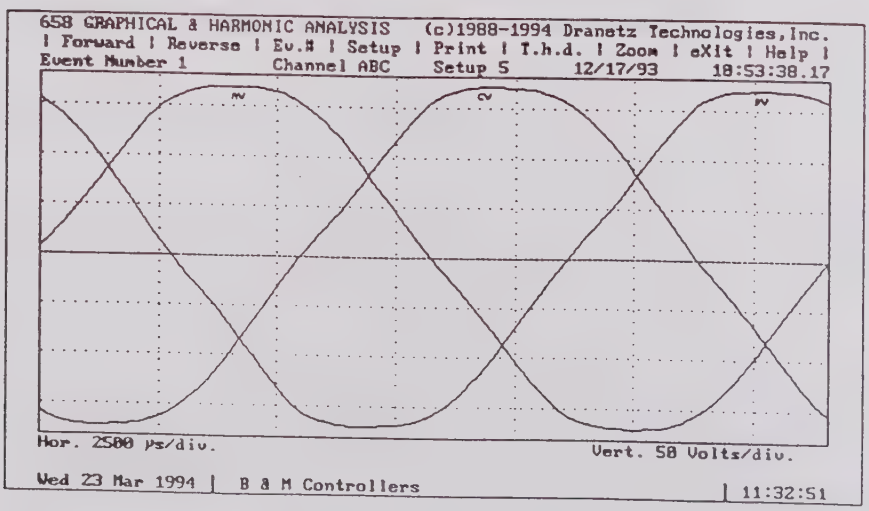
Overlaid Curves

This option allows you to display multiple channels on one plot.



Select the desired channel(s) and then select OK.

An example display is shown below.


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 1 Channel ABC Setup S 12/17/93 18:53:38.17
Hor. 2500 µs/div.
Vert. 50 Volts/div.
Wed 23 Mar 1994 | B & M Controllers | 11:32:51

Use the right and left arrow keys to move the vertical zoom markers. Use the up and down arrow keys to move the horizontal zoom markers. Each time an arrow key is pressed, a marker moves a certain distance. This distance is determined by the speed, which is indicated to the right of the active zoom marker. The slowest speed is 1 and the fastest is 9. To change the speed, press a numeric key from the top row of the keyboard.

With the Mouse

Position the grab box (square mouse cursor) over the zoom marker to be moved and click the left mouse button. The mouse cursor changes to an aiming cross-hair. Move the cross-hair to the desired location and click the left mouse button again. The zoom marker jumps to this new location.

To move two adjacent zoom markers, position the mouse cursor over the point where they intersect before clicking the left mouse button.

To un-grab a mistakenly grabbed marker, click the right mouse button or press *<Esc>*.

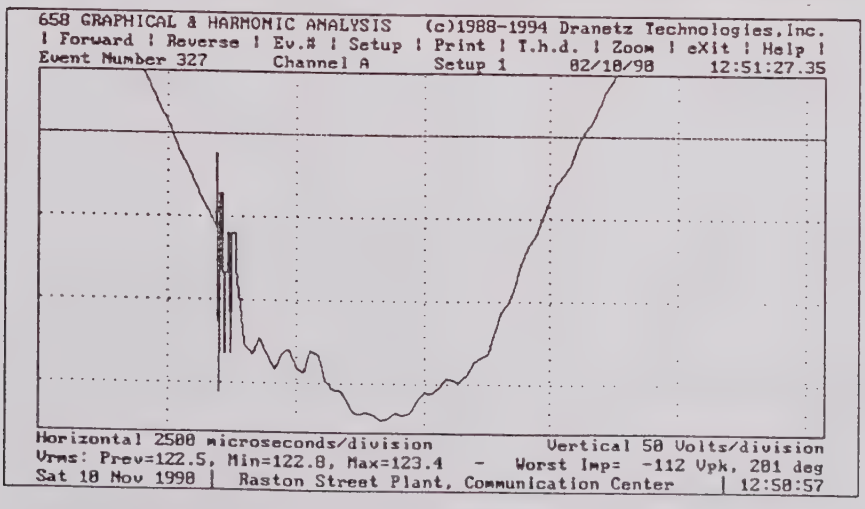
Zooming Out

To return to the previous zoom level, select *<Esc>*. To return to the original plot (complete time span) and skip over the previous zoom levels, select EXIT from the menu.

Clicking the right mouse button also zooms out one level at a time.

Zoom can also be used for estimating disturbance duration, frequency, and amplitude. The closer you are zoomed in on the disturbance, the more accurate this estimate will be. In the example shown below, the first illustration is of a half cycle of a waveform that contains a disturbance

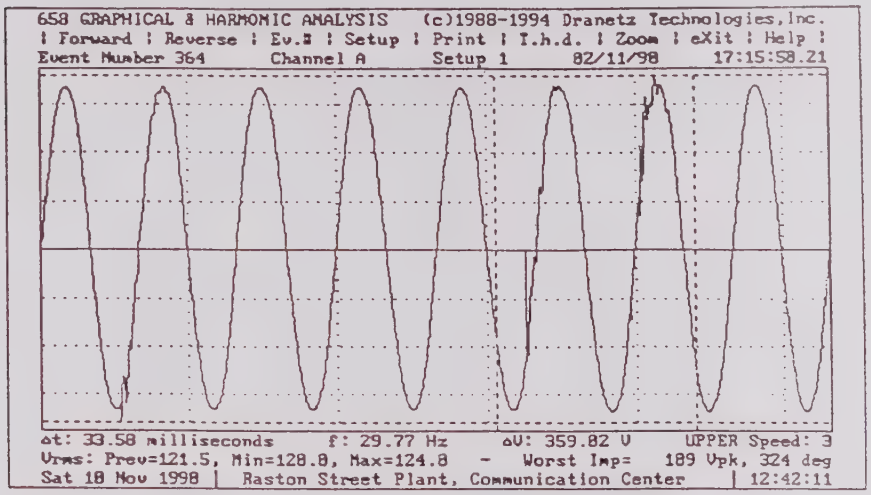
Zoomed Waveform


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 327 Channel A Setup 1 02/10/98 12:51:27.35
Horizontal 2500 microseconds/division Vertical 50 Volts/division
Vrms: Prev=122.5, Min=122.8, Max=123.4 - Worst Imp= -112 Vpk, 201 deg
Sat 10 Nov 1998 | Raston Street Plant, Communication Center | 12:58:57

This disturbance is then expanded with the zoom function, and in the illustration below, the zoom markers enclose one cycle of the disturbance. (This is different than a complete waveform cycle.)

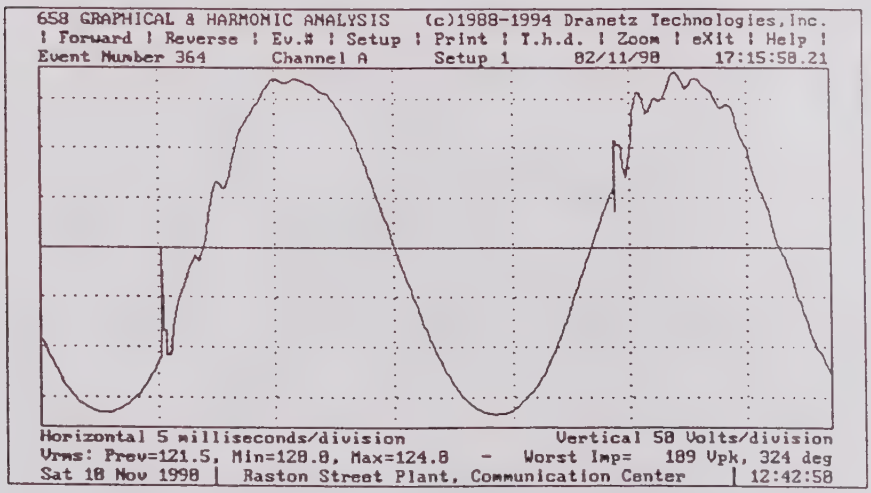
When ZOOM is selected from the menu, two vertical and two horizontal dashed lines (zoom markers) appear on the graph, as in the illustration below. The change in duration and frequency (1/duration) in the area bounded by the markers is indicated below the graph, along with peak t peak voltage or current (ΔV or ΔI).

Event Screen With Zoom Markers


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 364 Channel A Setup 1 02/11/98 17:15:58.21
Δt: 33.58 milliseconds f: 29.77 Hz ΔV: 359.82 V UPPER Speed: 3
Vrms: Prev=121.5, Min=128.8, Max=124.8 - Worst Imp= 189 Vpk, 324 deg
Sat 18 Nov 1998 | Raston Street Plant, Communication Center | 12:42:11

When ZOOM is selected a second time, the area between the zoom markers is expanded to fill the complete display window (as in the illustration below).

Zoomed Event

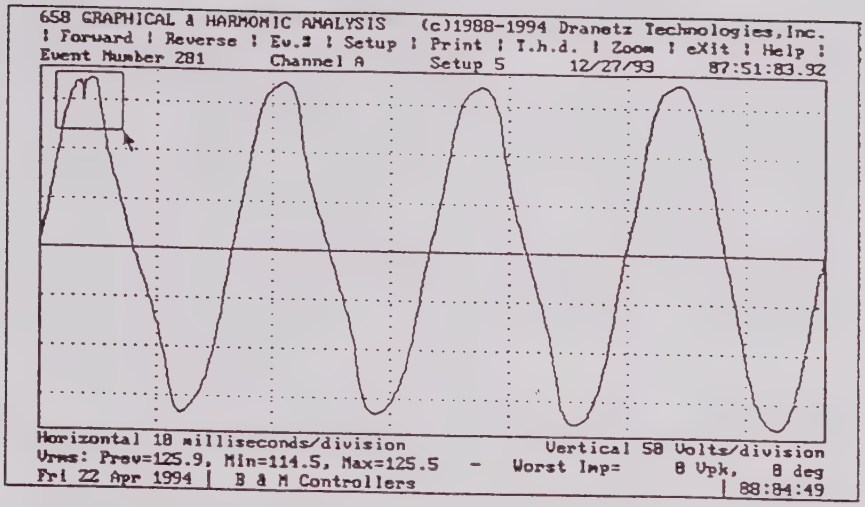

658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 364 Channel A Setup 1 02/11/98 17:15:58.21
Horizontal 5 milliseconds/division Vertical 50 Volts/division
Vrms: Prev=121.5, Min=128.8, Max=124.8 - Worst Imp= 189 Vpk, 324 deg
Sat 18 Nov 1998 | Raston Street Plant, Communication Center | 12:42:58

The zoom markers can be moved to select a different area of the plot for expansion. This can be done using the keyboard or the mouse.

With the Keyboard

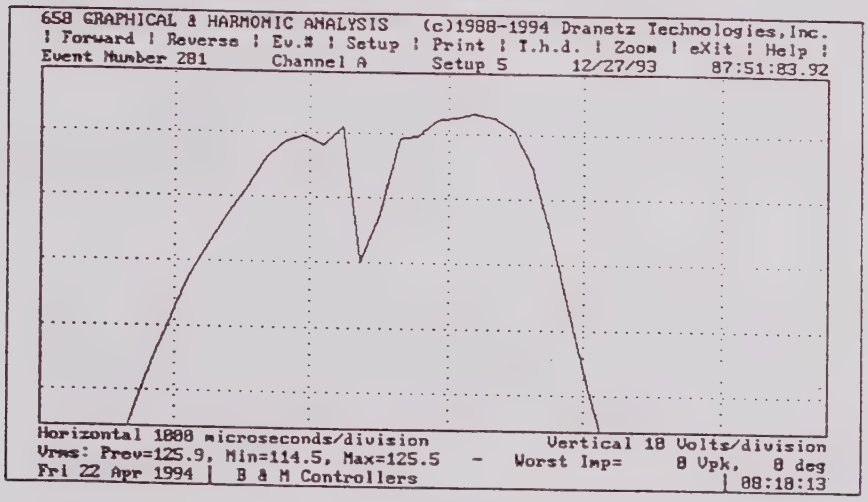
The bottom right hand corner of the screen indicates which zoom marker is the active one (upper, lower, right, or left). To change this, press the space bar.

Drawing a Quick Zoom Box


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 281 Channel A Setup 5 12/27/93 87:51:83.92
Horizontal 10 milliseconds/division Vertical 58 Volts/division
Vrms: Prev=125.9, Min=114.5, Max=125.5 - Worst Imp= 0 Vpk, 0 deg
Fri 22 Apr 1994 | B & M Controllers | 88:84:49

Click the left button again to zoom in on the area just drawn.

Zoomed Waveform


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 281 Channel A Setup 5 12/27/93 87:51:83.92
Horizontal 1000 microseconds/division Vertical 10 Volts/division
Vrms: Prev=125.9, Min=114.5, Max=125.5 - Worst Imp= 0 Vpk, 0 deg
Fri 22 Apr 1994 | B & M Controllers | 88:10:13

Click the right button to return to the previous zoom level.

Exit

The function performed by this options depends on what feature is active.

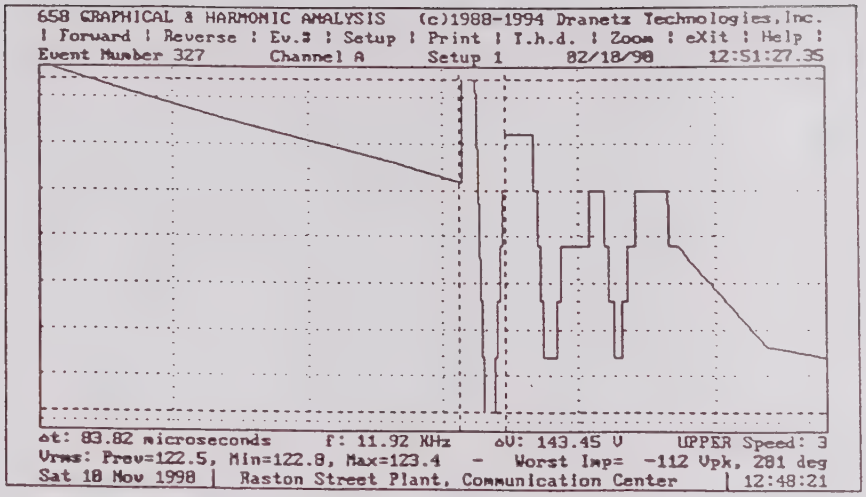
If you're viewing a zoomed waveform event, EXIT displays the original (complete) waveform.

If the setups display is on the screen, EXIT removes the display from the screen.

If performing a harmonic analysis, EXIT returns you to the previous screen.

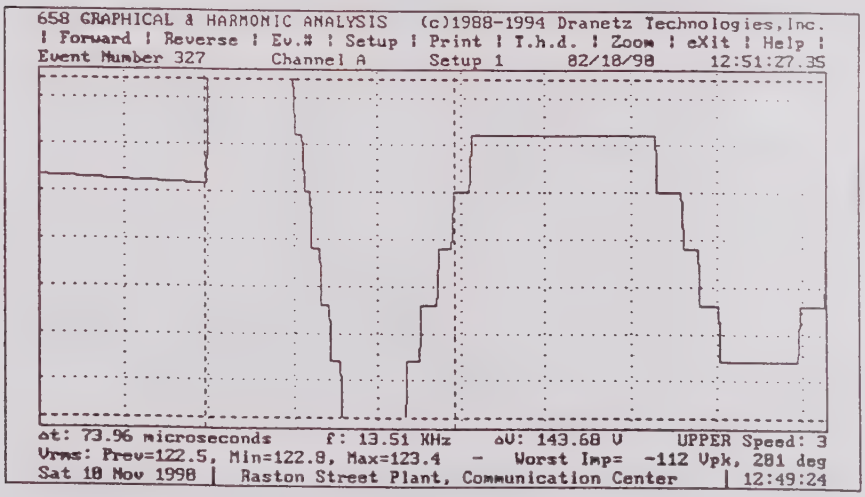
If viewing the original waveform or another event, the function performed by EXIT depends on the method used to start viewing events.

If the VIEW 1:ST EV. option was selected from the Summaries Screen Menu, selecting EXIT returns you to the plot that was on the screen when you started viewing events.


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 327 Channel A Setup 1 02/18/98 12:51:27.35
Δt: 83.82 microseconds f: 11.92 KHz ΔV: 143.45 V UPPER Speed: 3
Vrms: Prev=122.5, Min=122.8, Max=123.4 - Worst Imp= -112 Vpk, 281 deg
Sat 10 Nov 1998 | Raston Street Plant, Communication Center | 12:48:21

The line of text directly below the graph gives the duration (Δt). frequency (f, or 1/duration), and amplitude (ΔV) of the area enclosed by the zoom markers. To measure the disturbance more precisely, you can zoom in further and then place the zoom markers closer to the actual waveform. this is illustrated below.

More Precise Measurement


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 327 Channel A Setup 1 02/18/98 12:51:27.35
Δt: 73.96 microseconds f: 13.51 KHz ΔV: 143.68 V UPPER Speed: 3
Vrms: Prev=122.5, Min=122.8, Max=123.4 - Worst Imp= -112 Vpk, 281 deg
Sat 10 Nov 1998 | Raston Street Plant, Communication Center | 12:49:24

The distance between the right and left markers (duration) is 73.96 microseconds. The frequency of the disturbance, which corresponds to 1/duration is 13.51 kHz. The distance between the upper and lower markers (amplitude) is 143.68 volts.

Quick Zoom

A quick zoom feature that bypasses the menu Zoom command is available. With the waveform displayed, place the cursor at the position of the desired zoom box and click the left mouse button. Then move the cursor diagonally to draw a box around the desired area as shown on the next page.

If the EVENTS option was selected from the Main Menu, selecting EXIT returns you to the Main Menu.

Help

This option displays a brief description of the other options on the menu.

Harmonic Analysis

Harmonic Analysis can be performed on any cycle in the waveform. This analysis computes and displays the percent and phase shift of the components of harmonic distortion on the waveform. Transient disturbances with frequencies above 3 kHz (such as impulses) have little effect on the analysis.

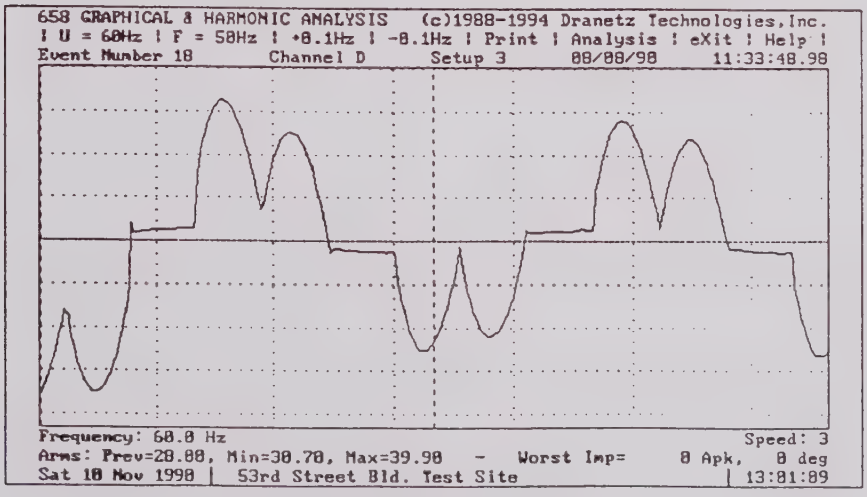
The default frequency is important when performing a harmonic analysis (especially on a single cycle event screen). If this is the first analysis performed for this run of the program, the default frequency is set at 60 Hz (standard in the U.S.) unless another default was chosen through the CHANGE DEFAULT FREQUENCY option in the Events pull-down menu. If the frequency was changed during a previous harmonic analysis, the default frequency is the frequency that was used in the previous analysis.

The exact steps involved in performing a harmonic analysis depend on the waveform the analysis is to be performed on. If the event waveform consists of only one cycle, the analysis begins when T.H.D. is selected from the menu. If the event waveform consists of more than one cycle, you must select the cycle to be analyzed.

Selecting Cycle

When T.H.D. is selected from the menu, and the waveform event has more than one complete cycle, the Harmonic Selection Screen appears:

Harmonic Selection Screen


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
U = 60Hz | F = 58Hz | +0.1Hz | -0.1Hz | Print | Analysis | eXit | Help
Event Number 18 Channel D Setup 3 08/08/98 11:33:48.98
Frequency: 60.0 Hz
Speed: 3
Arms: Prev=28.88, Min=30.78, Max=39.98 - Worst Imp= 8 Apk, 8 deg
Sat 10 Nov 1990 | 53rd Street Bld. Test Site | 13:01:09

The complete waveform is displayed on the screen (even if you were previously in a zoomed portion of the waveform), and two vertical dashed lines (markers) appear over the waveform creating a window. If the frequency is correct, the window should span one cycle of the waveform. The size of the window can be adjusted to allow for changes in frequency. The whole window can be moved to cover a different section of the waveform. The harmonic analysis will be performed on the section of the waveform contained in the window.

Moving the left marker moves the complete window (moves both markers). Moving the right marker changes the size (frequency) of the window.

The left marker can be moved by pressing the right and left arrow keys or by grabbing it with the mouse cursor. The number below the bottom right corner of the display window indicates the distance (speed) which the left marker is moved each time the right or left cursor key is pressed. This speed can be changed by pressing one of the numeric keys 1 through 9 (*<1>* for slowest, *<9>* for fastest) at the top of the keyboard.

The right marker can be moved in 0.1 Hz increments. Selecting +0.1HZ from the menu, or pressing the <+> key, increases the frequency and therefore decreases the size of the window. Selecting -0.1HZ from the menu, or pressing the <-> key, decreases the frequency and therefore increases the size of the window. The maximum frequency allowed is 65 Hz. The minimum frequency allowed is 45 Hz.

To grab a marker with the mouse, position the grab box over the line to be moved and click the left mouse button. The grab box is replaced by the aiming cross-hair, to let you know the marker has been grabbed. Move the aiming cross-hair to the new location and click the left mouse button again. The marker is now moved to this new location.

To un-grab a mistakenly grabbed marker, click the right mouse button or press *<Esc>*.

To ensure you have enclosed one complete cycle in your window, allowing for any variations in the frequency, it is recommended that the portion of the waveform you select begins and ends on a zero-crossing. Thus, if the first marker is on the first zero-crossing, the second marker should be on the third zero-crossing, with one zero-crossing lying between the two.

NOTE

If you change the frequency (by moving the second marker), this becomes the new default frequency. The old default frequency can be restored, if desired, after the analysis is performed. (This can be done from the Harmonic Selection Screen or from the Events pull-down menu.)

To exit out of the Harmonic Selection Screen (and return to the Event Screen) select EXIT from the menu on.

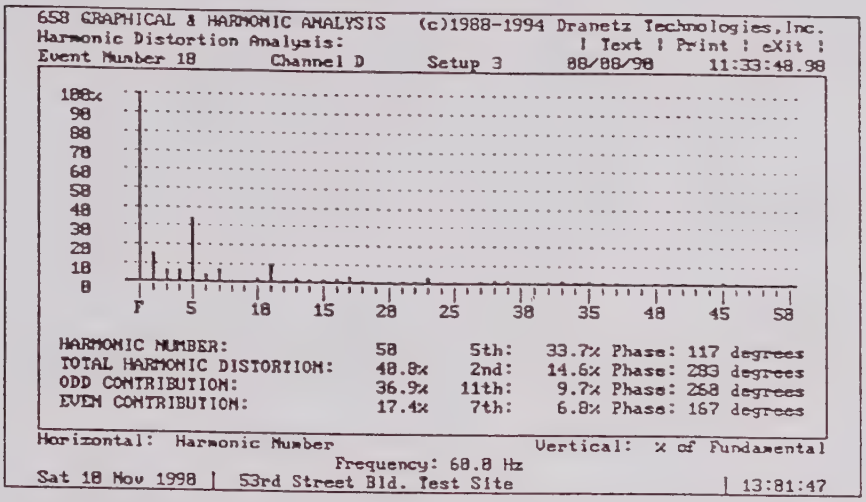
To print the currently displayed screen, including the waveform with the markers indicating the cycle to be analyzed, select PRINT from the menu. The screen image can be printed out at the present time or stored on the hard disk for printing at a later time.

Selecting HELP from the menu displays a screen briefly describing the other menu options. A second help screen is available for more detailed information on frequency selection and window setting.

Analyzing Cycle

Once you have identified the cycle you want analyzed, select ANALYZE from the menu. A screen similar to the one below appears, showing the amplitude of any harmonics:

Harmonic Analysis Screen


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
Harmonic Distortion Analysis: ! Text ! Print ! eXit !
Event Number 18 Channel D Setup 3 08/08/98 11:33:48.98
100%
90
80
70
60
50
40
30
20
10
0
F 5 10 15 20 25 30 35 40 45 50
HARMONIC NUMBER: 50 5th: 33.7% Phase: 117 degrees
TOTAL HARMONIC DISTORTION: 48.8% 2nd: 14.6% Phase: 283 degrees
ODD CONTRIBUTION: 36.9% 11th: 9.7% Phase: 258 degrees
EVEN CONTRIBUTION: 17.4% 7th: 6.8% Phase: 167 degrees
Horizontal: Harmonic Number Vertical: % of Fundamental
Frequency: 60.0 Hz
Sat 10 Nov 1990 | 53rd Street Bld. Test Site | 13:01:47

The first harmonic is the fundamental, and the amplitude reads 100% (by definition).

Below the chart are two columns of text. The left hand column displays general harmonic distortion information, and the right hand column displays information about specific harmonics.

"Harmonic number" indicates the number of the last harmonic the program has completed analyzing. When this number reaches 50, the analysis is complete.

The percent total harmonic distortion is displayed, along with the percentage of the total caused by the odd harmonics, and the percentage of the total caused by the even harmonics. The formula relating the three percentages is given below.

$$(\text{odd contribution})^2 + (\text{even contribution})^2 = (\text{total distortion})^2$$

The right hand column lists, in order of severity, the most distorted harmonics. The amplitude and the phase shift of each harmonic is also listed.

The menu contains the following options: TEXT, PRINT, and EXIT. Selecting TEXT presents you with a screen similar to the one on the next page.

Each harmonic is listed with its amplitude and phase shift. The total harmonic distortion, the even contribution, and the odd contribution, are shown at the bottom of the screen.

The menu selections are PRINT and EXIT.

Select PRINT from either the Harmonic Analysis Screen or the Harmonic Text Screen to print out the screen's image or to save the image to disk.

Selecting EXIT from the Harmonic Analysis Screen or from the Harmonic Text Screen returns you to the Harmonic Selection Screen.

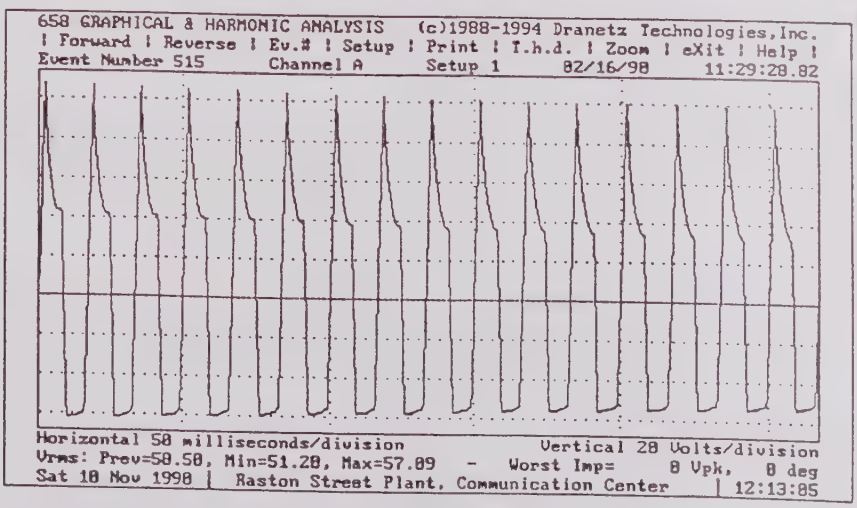
Harmonics Text Screen

```
658 GRAPHICAL & HARMONIC ANALYSIS   (c)1988-1994 Dranetz Technologies,Inc.
Harmonic Distortion Analysis:                              ¦ Print ¦ eXit ¦
Event Number 18        Channel D        Setup 3        08/08/98      11:33:48.98

 Fnd:  36.76A 199 deg      18th:  1.8% 221 deg      35th:  1.5% 142 deg
  2nd:  14.6% 283 deg      19th:  0.2% 287 deg      36th:  0.7% 187 deg
  3rd:   6.8% 276 deg      20th:  0.9% 255 deg      37th:  0.7% 284 deg
  4th:   6.3% 318 deg      21st:  1.3% 300 deg      38th:  0.6% 276 deg
  5th:  33.7% 117 deg      22nd:  0.7%  85 deg      39th:  0.7%  55 deg
  6th:   4.3% 251 deg      23rd:  3.3% 200 deg      40th:  1.3% 161 deg
  7th:   6.8% 167 deg      24th:  1.8% 238 deg      41st:  1.4% 251 deg
  8th:   0.5% 289 deg      25th:  0.9% 221 deg      42nd:  0.8% 246 deg
  9th:   0.1% 266 deg      26th:  0.4% 220 deg      43rd:  0.4% 251 deg
 10th:   2.7% 100 deg      27th:  1.1% 155 deg      44th:  0.6% 143 deg
 11th:   9.7% 260 deg      28th:  1.8% 210 deg      45th:  1.5% 191 deg
 12th:   1.1% 273 deg      29th:  1.8% 323 deg      46th:  1.1% 254 deg
 13th:   2.7% 270 deg      30th:  0.4% 265 deg      47th:  0.5%  60 deg
 14th:   1.6% 236 deg      31st:  0.3% 230 deg      48th:  0.3% 127 deg
 15th:   2.8% 222 deg      32nd:  1.8% 200 deg      49th:  0.6% 153 deg
 16th:   2.8% 274 deg      33rd:  1.5% 250 deg      50th:  1.8% 210 deg
 17th:   3.4%  42 deg      34th:  0.8% 320 deg

T.H.D.:   40.8%          ODD CONTRIB.:   36.9%          EVEN CONTRIB.:   17.4%
                              Frequency: 60.0 Hz
Sat 10 Nov 1990 ¦  53rd Street Bld. Test Site                    ¦ 13:02:05
```

Selecting With Zoom

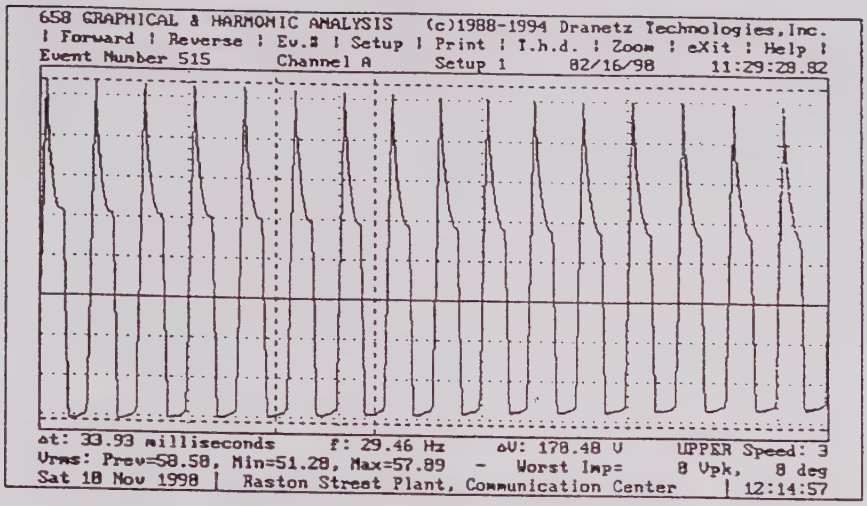
Sometimes many waveform cycles appear as one event, making it difficult to isolate one complete cycle from the current screen. The ZOOM option simplifies this task by allowing you to enlarge a selected portion of the waveform.

Multiple Cycle Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
¦ Forward ¦ Reverse ¦ Ev.# ¦ Setup ¦ Print ¦ T.h.d. ¦ Zoom ¦ eXit ¦ Help ¦
Event Number 515 Channel A Setup 1 02/16/98 11:29:28.02
Horizontal 50 milliseconds/division Vertical 20 Volts/division
Vrms: Prev=50.50, Min=51.20, Max=57.09 - Worst Imp= 0 Vpk, 0 deg
Sat 10 Nov 1990 ¦ Raston Street Plant, Communication Center ¦ 12:13:05

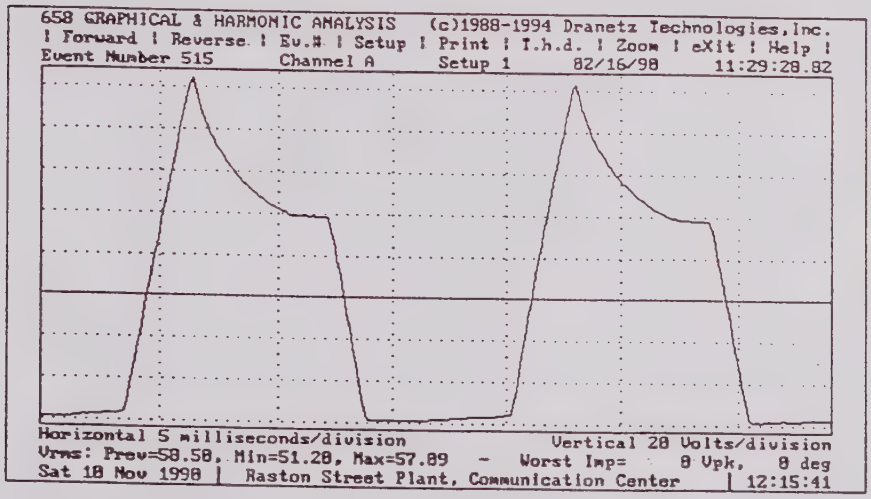
In the event illustrated above, the disturbances were such that subsequent cycles differed from the one they were being compared to. This caused all the cycles to be included as one event. Because of the number of events and the size of the screen, the waveform appears somewhat compressed. With the ZOOM feature, we can expand portions of the waveform to see their true shape, as indicated in the illustrations below.

Selecting a Smaller Segment


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 515 Channel A Setup 1 02/16/98 11:29:28.82
Δt: 33.93 milliseconds f: 29.46 Hz ΔV: 178.48 V UPPER Speed: 3
Vrms: Prev=58.58, Min=51.28, Max=57.89 - Worst Imp= 0 Vpk, 0 deg
Sat 18 Nov 1998 | Raston Street Plant, Communication Center | 12:14:57

The marked off portion of the waveform above expands to the total screen size as illustrated below.

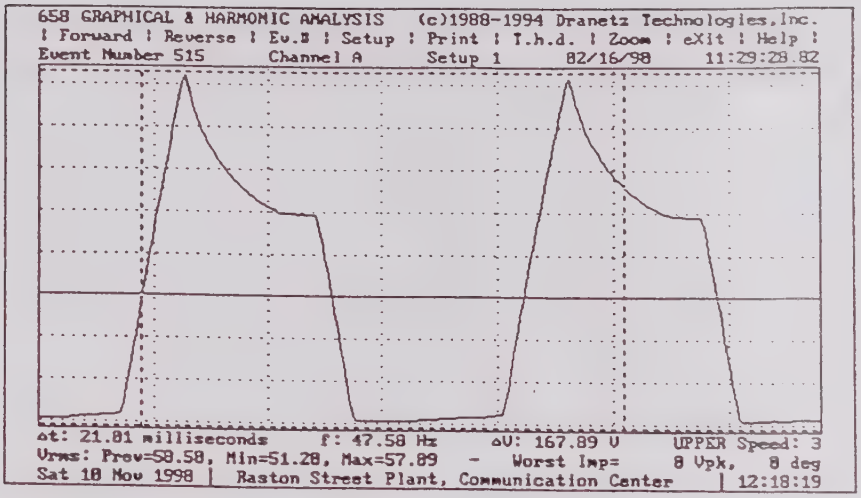
Zooming the Selected Segment


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 515 Channel A Setup 1 02/16/98 11:29:28.82
Horizontal 5 milliseconds/division Vertical 20 Volts/division
Vrms: Prev=58.58, Min=51.28, Max=57.89 - Worst Imp= 0 Vpk, 0 deg
Sat 18 Nov 1998 | Raston Street Plant, Communication Center | 12:15:41

From here you can measure the frequency of individual waveform cycles, and also isolate the cycle to analyze. Actual frequency may differ slightly from the desired frequency and would affect the harmonic analysis.

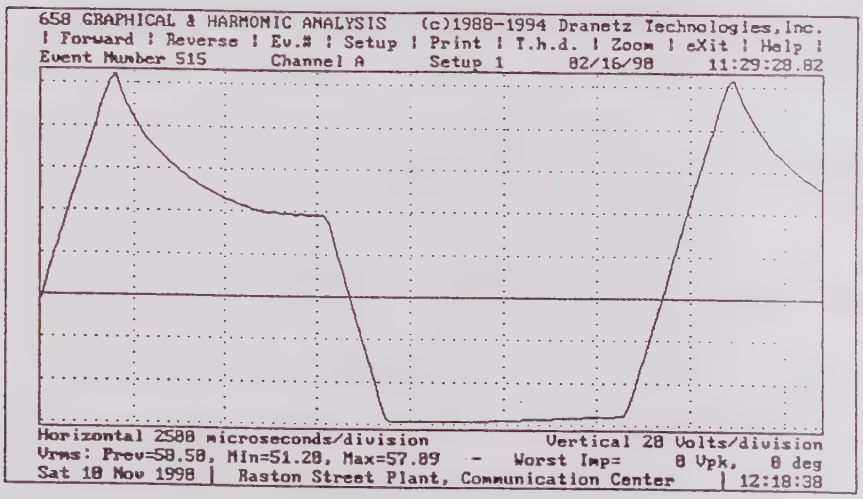
To isolate the cycle, position the left zoom marker on the first zero crossing of the waveform cycle (the positioning of the other markers is not critical at this point) as indicated in the illustration below.

Marking the Zero-Crossing


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 515 Channel A Setup 1 02/16/98 11:29:28.82
Δt: 21.01 milliseconds f: 47.58 Hz ΔV: 167.89 V UPPER Speed: 3
Vrms: Prev=58.58, Min=51.28, Max=57.89 - Worst Imp= 0 Vpk, 0 deg
Sat 10 Nov 1998 | Raston Street Plant, Communication Center | 12:18:19

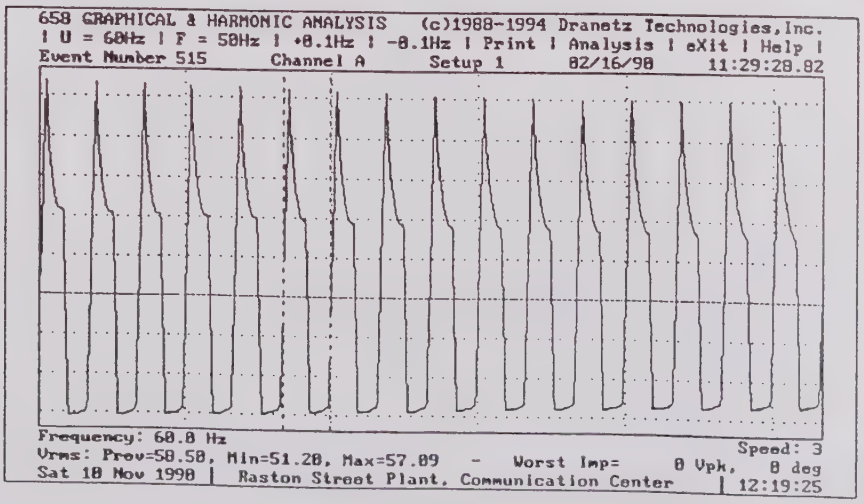
Select ZOOM again so that the zero-crossing you just selected appears at the beginning of the screen, similar to the illustration below:

Zoomed Zero-Crossing


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| Forward | Reverse | Ev.# | Setup | Print | T.h.d. | Zoom | eXit | Help |
Event Number 515 Channel A Setup 1 02/16/98 11:29:28.82
Horizontal 2588 microseconds/division Vertical 28 Volts/division
Vrms: Prev=58.58, Min=51.28, Max=57.89 - Worst Imp= 0 Vpk, 0 deg
Sat 10 Nov 1998 | Raston Street Plant, Communication Center | 12:18:38

When T.H.D. is selected from the Event Screen Menu, the following Harmonic Analysis Screen Appears.

Multiple Cycle Event


658 GRAPHICAL & HARMONIC ANALYSIS (c)1988-1994 Dranetz Technologies,Inc.
| U = 60Hz | F = 50Hz | +0.1Hz | -0.1Hz | Print | Analysis | eXit | Help |
Event Number 515 Channel A Setup 1 02/16/98 11:29:28.82
Frequency: 60.0 Hz Speed: 3
Vrms: Prev=58.58, Min=51.28, Max=57.89 - Worst Imp= 0 Vpk, 0 deg
Sat 10 Nov 1998 | Raston Street Plant, Communication Center | 12:19:25

The window that the markers form begins at the portion of the waveform that was located at the beginning of the last zoom screen you selected. At this point, adjust the frequency, if necessary. The first marker stays at the beginning of the cycle. The movement of the second marker may be imperceptible if there are many cycles on the screen, but the correct frequency will be used when computing the harmonic disturbance.

Select ANALYSIS from the menu to begin the analysis.

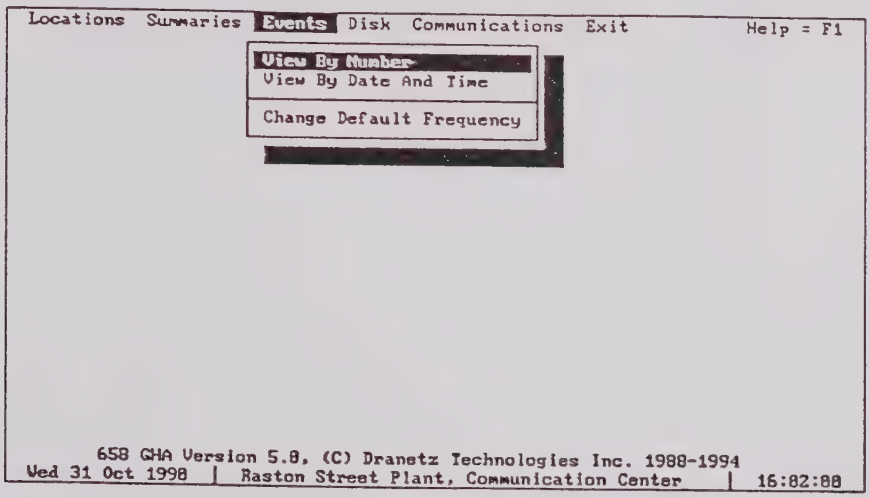
Changing Default Frequency

The default frequency used in harmonic analysis can be changed two ways: during a harmonic analysis and by using the CHANGE DEFAULT FREQUENCY option on the Events pull-down menu.

When the frequency is changed during a harmonic analysis (by moving the second marker on the Harmonic Selection Screen), that frequency becomes the new default frequency.

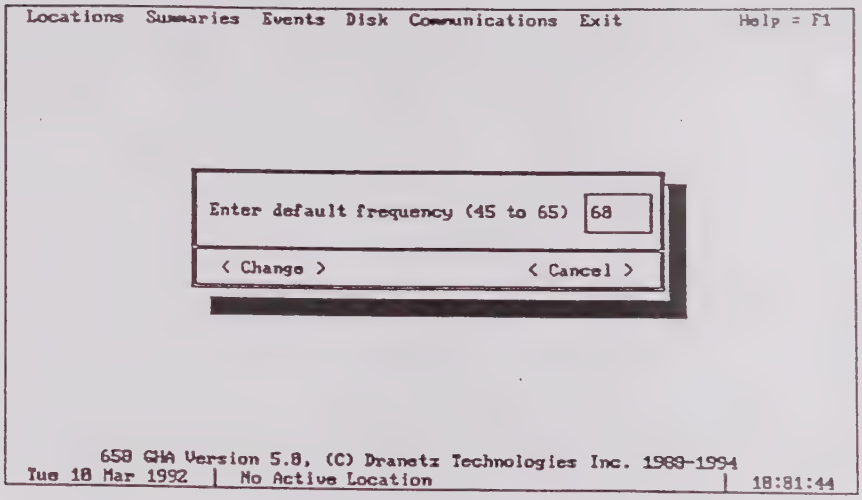
The default frequency can also be changed by selecting the CHANGE DEFAULT FREQUENCY option on the Events pull-down menu (illustrated below).

Events Pull-Down Menu


Locations Summaries Events Disk Communications Exit Help = F1
View By Number
View By Date And Time
Change Default Frequency
658 GHA Version 5.8, (C) Dranetz Technologies Inc. 1988-1994
Wed 31 Oct 1998 | Raston Street Plant, Communication Center | 16:02:08

When this option is selected a dialog box appears on the screen, prompting for a new default frequency.

Change Default Frequency Dialog Box


Locations Summaries Events Disk Communications Exit
Help = F1
Enter default frequency (45 to 65) 68
< Change >
< Cancel >
650 GHA Version 5.8, (C) Drametz Technologies Inc. 1989-1994
Tue 18 Mar 1992 | No Active Location | 18:81:44

Type in the desired frequency and press <*Enter*>. The default is changed and you are returned to the Main Menu.

APPENDIX A
COLOR, RESOLUTION, AND GRAPHIC ADAPTORS

General Information

The 658 Graphical and Harmonic Analysis Software has been designed to automatically detect the graphics adapter present in your PC and adjust to the maximum possible resolution.

The table below shows the actual results with the different video cards available from IBM:

Video Card	Memory	Resolution	Color
IBM CGA	16K	640 x 200	NO
IBM EGA	64K	640 x 200	NO
IBM EGA	128K	640 x 200	YES
IBM EGA	256K	640 x 350	YES
IBM VGA	256K	640 x 350	YES

APPENDIX B
HEWLETT PACKARD THINKJET CONFIGURATION

General Information

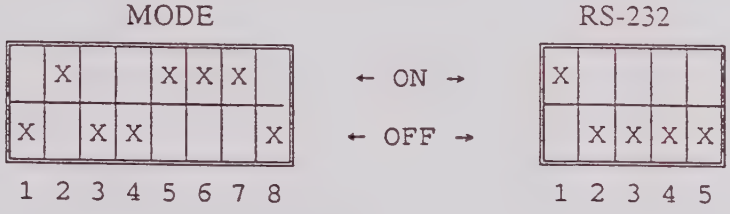
In addition to Epson and IBM printers, Dranetz 658 Graphical and Harmonic Analysis Software supports the Hewlett Packard ThinkJet serial printer. (This printer can also be used as an external printer for the analyzer. Refer to your analyzer operator's manual for more information.)

Configuration

In order to be compatible with the Graphical and Harmonic Analysis software, the ThinkJet must first be set up properly.

Printer Preparation

Connect the ThinkJet to one of the PC's serial ports using a Hewlett Packard serial cable (Hewlett Packard part number 13242-60011). Set the ThinkJet's DIP switches as follows:



PC Preparation

BEFORE running the Graphical and Harmonic Analysis software, the following DOS commands must be executed (replace "n" in the example below with the number of the PC serial port to which the printer is connected). At the DOS prompt,

type: **MODE COMn:9600,n,8,1,P** press <*Enter*>
type: **MODE LPT1=COMn** press <*Enter*>

Program Execution

Run the Graphical and Harmonic Analysis program as usual. If all of the above steps were properly followed, the output to the printer will automatically be redirected to the ThinkJet.

NOTE

Due to the difference in resolution (dots per inch) between the Hewlett Packard ThinkJet and an Epson or IBM dot matrix printer, the images printed by the different printers will not be the same size.

APPENDIX C
PRINTING GHA GRAPHICS IN WORDPERFECT 5.1

General Information

To incorporate graphics in their documents, WordPerfect users can run the "Grab" utility embedded in the WordPerfect software. Grab is a screen capture utility which allows you to import graphic images directly into your WordPerfect document. Once the images are captured, they can be combined with text in a report, or spooled out to the printer in a batch of several waveform graphs, for example.

How to Use the Grab Utility

Grab is a built-in feature of WordPerfect 5.1. It is called up from the directory where WordPerfect resides by typing **grab** then pressing *<Enter>*. Successful use of the utility for this particular job, however, depends on a few hints, in addition to the basic procedure:

1. You must run 658GHA in the black-and-white (monochrome) mode in order to capture a useable image. The file extension </B> should be added to the executable filename to invoke the black-and-white mode; e.g., **658GHA/B**.

2. File extensions can also be used in the Grab executable file which are very helpful. Examples are the following:

   /M monochrome (black-and-white) capture mode.

   /D= where D=pathString specifies the directory where graphics files will be saved.

   /K keeps the image size first used as a reference for all new images.

   A typical recommended configuration, then, would be: **GRAB/M/K/D=\dir** where "dir" represents the name of the directory where you wish to store graphic files.

   A helpful shortcut is to create a batch file to call the entire file namestring automatically.

3. Grab is a Terminate-and-Stay-Resident (TSR) program and can compete for memory space with other programs, including GHA. You should load Grab only after data transfer from diskette or serial port is completed, because memory usage is highest during data transfer. Grab can be removed from memory by typing **GRAB/R** (for remove), then press *<Enter>*.

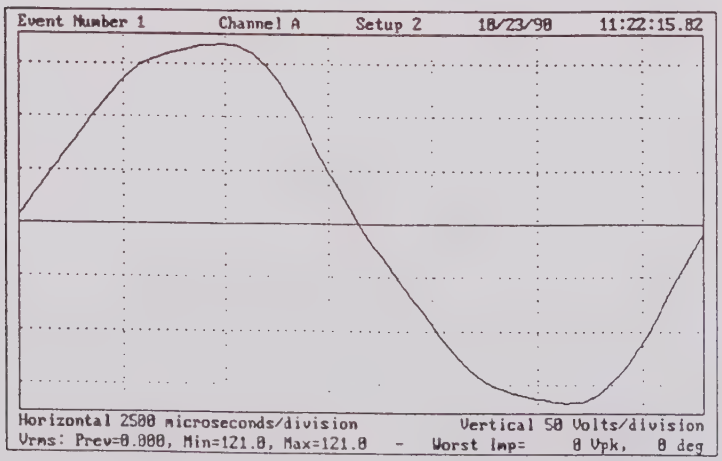
Once you have performed the procedures listed above, run Grab. run GHA in monochrome mode, and bring the waveform you want onto the screen. Then press <*Alt*> + <*Shift*> + <*F9*> to call up Grab. You will hear a two-tone beep indicating that Grab is active. and blinking cursors will appear on the screen outlining the area to be captured. You may move or expand the outline box by using the cursor keys. the shift key, and the insert key. (Details on Grab controls are available by typing **grab/h** at the C:\> prompt, for on-line help.) Once the box is the proper size, press <*Enter*> to complete the screen capture. (If you ran Grab with the /K file extension, this box size will now be retained for the next graph as well.)

The Grab program will now create a .WPG graphics file to store the image. Successive files will be automatically named GRAB.WPG, GRAB1.WPG, GRAB2.WPG, etc. When the process is complete, you will hear the two-tone beep once again indicating successful completion.

Creating a Figure in Your WordPerfect Document

When you have captured all the waveform graphics files you need, the next step is to import them into your WordPerfect document. This is accomplished by creating a "figure". From inside the blue WordPerfect document screen, press <*Alt*> + <*F9*> to invoke the Graphics option. Press <*1*> to choose Figure. When the next menu appears. press <*1*> again to choose Create.

You will now have the full-page Figure Definition menu on-screen. Press <*1*> to enter the filename of the graphics file you wish to place in the document, e.g., GRAB2.WPG. You may view a list of all graphics files and choose one by pressing <*F5*> (List File) when the program prompts for filename. Other choices which can be made in this menu include position on the page and caption, if you wish to add one. Choice #9, Edit, must be called up to change the image from white-on-black to black-on-white with the Invert command, so that the graph will look like the one below.



Other details of figure placement on the page, interaction with text on the page, etc., are explained in the HELP messages available within WordPerfect. Remember when you send your completed document to the printer that high-resolution graphics usually require more time to print than standard text files.

APPENDIX D
658 ASCII UTILITY

INTRODUCTION

658-ASCII-UTIL is a PC based software utility that is included with GHA. It converts events captured using a Model 656A/657/658 Analyzer, version 3.0 or higher, to ASCII, and transfers them to the hard disk of a PC.

This appendix describes the PC hardware and software that is needed to run the program, the operating sequence of the program, and gives examples of 65X event types before and after conversion.

TERMINOLOGY

65X Analyzer: A Dranetz 656A, 657, or 658 Analyzer.

65X event diskette: The floppy disk that contains data collected by a 65X Analyzer.

ASCII output file: The file containing converted 65X events that is stored on a PC's hard disk.

Pseudo RMS event: An RMS event collected by a 65X analyzer by periodically sampling the input channels. It is used primarily to fill in the spaces between events on the time plot A pseudo event is not viewable on a 65X analyzer; it is only viewable after it has been converted to an ASCII output file. Pseudo events are numbered starting at 10000 in the ASCII file, but are kept in chronological order.

Pseudo prime RMS event: An RMS event that shows the voltage value prior to an out of limits waveform event.

CONVENTIONS

Throughout this appendix 65X will be used to reference a 656A, 657, or 658 Analyzer.

Onscreen text is represented in a smaller, different typeface:

INSERT 656A/657/658/ EVENT DISKETTE INTO SOURCE DRIVE

REQUIRED EQUIPMENT

Dranetz 658-ASCII software runs on an IBM Personal Computer (PC, XT, AT, PS2, 286, 386 or 486), or 100% compatible IBM clone, equipped with the following:

- One hard disk (2 to 6 megabytes of disk space is needed for every full 65X event diskette converted).
- One double-sided 3-1/2" disk drive capable of reading 720 kilobytes disks in either drive A or B, without the need for special device drivers.
- 256k minimum random access memory (RAM).
- Disk operating system MS/PC DOS, Version 3.x or higher.

INSTALLATION

Create the directory C:\658ASCII on your hard drive. Copy the contents of the 658-ASCII-UTIL program diskette into the C:\658ASCII directory.

OPERATION

To run the 658-ASCII program, type the following command at the DOS prompt:

ASCII65X
then press <*Enter*>.

The following screen will appear:

SCREEN #1

```
                    ASCII CONVERSION UTILITY
            FOR DRANETZ MODEL 656A/657/658 EVENT FILES

                    ASCII65X Release V4.0, Mar. 1994
          Copyright c 1992 - 1994 by Dranetz Technologies, Inc.

This utility converts binary Events recorded by the Dranetz Model 658 Power Quality Analyzer,
Model 656A or 657 Disturbance Waveform Analyzer ( Version 3.xx Operating System ) into an
ASCII format data file.  The ASCII output file provides a format generally compatible with PC-
based data analysis programs available from other software vendors.  Users of the above Dranetz
instruments may employ such third-party software to provide statistical analysis and/or other
types of reports on recorded power quality data, according to their specific reporting
requirements.

PRESS ANY KEY TO CONTINUE >
```

NOTE

Screen numbers are given in this manual for reference only, they do not appear in the program.

After exiting the main screen, the program prompts you for the floppy drive the event diskette will be read from.

SCREEN #2A

```
          INSERT 656A/657/658/ EVENT DISKETTE INTO SOURCE DRIVE

                    CHOOSE SOURCE DRIVE:  *DRIVE A
                                           DRIVE B

          < Press <SPACE> to Toggle Source Drive selection >

          < Press <ESC> to Exit >
          < Press <ENTER> to Continue >
```

When <*ENTER*> is pressed, the program will proceed to Screen #3A. If <*ESC*> is pressed, the following message will appear.

SCREEN #2B

```
END OF JOB:FILE WAS NOT CREATED

Would you like to convert another Event diskette?
<Y>es, <N>o to quit:
```

Pressing <*Y*> will take you to screen #3A and pressing <*N*> will return you to the DOS prompt.

SCREEN #3A

An ASCII output data file will be created on your Hard Disk:

Specify Path for output file...
Default Path : C:\

Specify FILENAME for output file...
Default Filename: OUT.ASC
Source Drive: A:
ASCII output destination: C:\out.asc

Press <ENTER> to Continue, <ESC> to Cancel.

A: is the currently logged source drive. C:\ is the currently logged output drive and directory. The *<Backspace>* key can be used to edit the path and filename. *<Esc>* will take you back to screen #2A and *<Enter>* will take you to screen #4A, unless a file already exists with the same filename. If this is the case, the following message appears:

SCREEN #3B

Selected file exists: overwrite? <Y>es, <N>o, <ESC> to quit:

Answering 'N' will take you back to screen #3A. Answering 'Y' will take you to screen #4A. *<Esc>* will terminate operation and take you to the DOS prompt.

If execution proceeds successfully, the program will check the disk format and then read the event diskette.

SCREEN #4A

CHECKING DISK FORMAT

Press <ESC> To Abort...

The program will check for a valid data disk. An error message will be displayed if the disk is not found or the if disk has the wrong data version (the disk has data from a pre-3.0 65X analyzer).

Pressing *<Esc>* will cause a floppy disk error. Press any key to return to the DOS prompt.

SCREEN #4B

DISK FORMAT IS 18 SECTOR
READING TRACK: XX OF XX

Press <ESC> To Abort...

If *<Esc>* is pressed, you will be returned to screen #2A.

SCREEN #4C

XXX EVENTS ON DISK

Enter event # to convert, <CR> for all :

Events can be converted one at a time by entering a number and pressing *<Enter>*. When you are finished converting the desired number of events, press *<Enter>*.

NOTE

Event numbers can be entered in ascending order only.

SCREEN #4D

PROCESSING EVENT # XXX of XXX

If <*Esc*> is pressed, an ASCII output file will be created that only contains the number of events converted up to that point.

NOTE

The total reflected in XXX does not include PSEUDO RMS events.

If the conversion is completed successfully, the program will display the following message:

SCREEN #5

END OF JOB:FILE filename CREATED

Would you like to convert another Event diskette?
<Y>es, <N>o to quit:

Filename is the entire path and filename that was specified on screen #3A.

'Y' will return you to screen #2A, and 'N' will return you to the DOS prompt.

PROBLEMS

If a non-recoverable error is encountered which aborts the conversion process, an error-specific message will be displayed and you will be returned to Screen #2A.

ASCII EVENT FILE FORMAT

The 65X analyzers capture five disturbance event types: Waveform, RMS, Frequency, On/Off, Sensor, and Pseudo RMS.

The converted event file begins with the EVENT# keyword, followed by a comma character, then either another keyword (see following list) or data collected by a 65X analyzer (such as time or voltage). The event file always ends with the END_OF_BLOCK keyword and a comma character.

The following example defines event number 25, July 10, 1991 at 10:58:55.99 as a Power-Off Event and this event has no site identification information.

"EVENT#",25
"DATE",071091
"TIME",10585599
"TYPE",POWEROFF
"SITE_ID",NOSITE
"END_OF_BLOCK",

LIST OF KEYWORDS

%RH	Percent Relative Humidity
-	Negative quantity
A	INPUT channel A
APK	Amps peak
ARMS	Amps RMS
B	INPUT channel B
C	INPUT channel C
CHANNEL	Channel ID
D	INPUT channel D
DATE	Date of event
DEC	Voltage/current decrement event
DEG_C	Degrees Celsius
DEG_F	Degrees Fahrenheit
END_OF_BLOCK	Physical end of the event
END_OF_DATA	Physical end of samples
EVENT#	Event number
FREQUENCY	Sync-channel frequency event
FROM	Previous value
HERTZ	Hertz
HF_COUNT	Number of impulses in the event
HF_MAX	Maximum impulse sample value in event
HF_MIN	Minimum impulse sample value in event
HF_PHASE	Phase of the worst impulse in the event
HI_LIMIT	High RMS limit threshold setting
HI_TO_LO	High limit to low limit crossing event
HI_TO_NORMAL	High limit crossing to normal event
IMPULSE	Impulse waveform event
INC	Voltage/current increment event
INITIAL_RMS	Initial RMS event type
INITIAL_SENSOR	Initial sensor event
LO_LIMIT	Low RMS limit threshold setting
LO_TO_HI	Low limit to high limit crossing Event
LO_TO_NORMAL	Low limit crossing to normal event
MAX_VALUE	Maximum/minimum RMS value while outside limit
MONITOROFF	Monitoring OFF event
MONITORON	Monitoring ON event
NORMAL_TO_HI	Normal to high limit crossing event
NORMAL_TO_LO	Normal to low limit crossing event
NOSITE	No site identification information flag
POWEROFF	Power-off event
POWERON	Power-on event
PSEUDO	Periodic measurement of the input channels event
PSEUDOPRIME	Out of limit measurement event of the input channels that precedes a waveform event
RMS_MAX	Maximum low freq. rms cycle value in the event
RMS_MIN	Minimum low freq. rms cycle value in the event
RMS_SENSITIVITY	sensitivity used to trigger INC/DEC event
S1	Sensor channel 1
S2	Sensor channel 2
S3	Sensor channel 3
S4	Sensor channel 4
S5	Sensor channel 5
S6	Sensor channel 6

S7	Sensor channel 7
S8	Sensor channel 8
SITE_ID	Site identification information
TIME	Time of event
TO	Present value
TYPE	Event type
UNITS	Engineering units used for VALUE entry
V/M	Volts/meter RF
VALUE	Magnitude value captured with the event
VPK	Volts peak
VPP_RF	Volts peak to peak RF
VRMS	Volts RMS
WAVE	Low frequency waveform event

COMMON EVENT INFORMATION

The information below is common to all types of ASCII events files:

a. EVENT# sequential number

NOTE

Pseudo and Pseudo Prime RMS event sequence starts with Event # 10000. For example, the event sequence may be 1, 2, 3, 10000, 4, 5, 10001, 6, etc.; however, the chronological order of the Events will always be maintained.

b. DATE in MM/DD/YY format
c. TIME in HH:MM:SS.SS format
d. SITE_ID as recorded by the 65X Analyzer.

e. END_OF_BLOCK NOTE

If there is no site ID, the program will enter NOSITE in this field.

The rest of the information in the event is relevant only to the specific type of event, as shown in the following examples.

65X EVENTS AND EQUIVALENT ASCII EVENTS

The example events given below were obtained from a 658 Analyzer. The same events can be viewed with a 656A Analyzer, or with a 657 Analyzer using GHA software.

On/Off

DRANETZ 658 Power Quality Analyzer

Event #5 2/08/90 17:26:34.86

== 658 SYSTEM POWER ON ==

"EVENT#",5
"DATE",020890
"TIME",17263486
"TYPE",POWERON
"SITE_ID","DRANETZ 658 Power Quality Analyzer"
"END_OF_BLOCK",

RMS

DRANETZ 658 Power Quality Analyzer

Event #2, Channel A Setup #2
Wed. Jan 15, 1992 16:05:37.10

DRANETZ 658 Power Quality Analyzer

== INITIAL RMS EVENT ==

HIGH Limit: 170.0 Vrms
LOW Limit: 162.0 Vrms
Sens: 3.0 Vrms

Value when setup activated: 0.2 Vrms

"EVENT#,2
"DATE",011592
"TIME",16053710
"TYPE",INITIAL_RMS
"UNITS",ARMS
"CHANNEL",A
"VALUE",0.200
"HI_LIMIT",170.000
"LO_LIMIT",162.000
"RMS_SENSITIVITY",3.000
"SITE_ID",658 Power Quality Analyzer
"END_OF_BLOCK",

Frequency

DRANETZ 658 Power Quality Analyzer

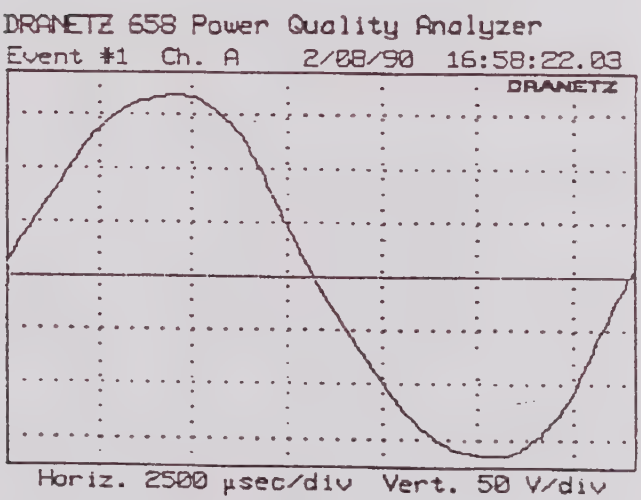
Event #7 1/15/92 16:05:49.55

== FREQUENCY CHANGE EVENT ==

From 45.0 Hz to 60.0 Hz

"EVENT#",7
"DATE",011592
"TIME",16054995
"TYPE",FREQUENCY
"UNITS",HERTZ
"FROM",45
"TO",60
"SITE_ID",658 Power Quality Analyzer
"END_OF_BLOCK",

Waveform



"EVENT#",1
"DATE",020890
"TIME",16582203
"TYPE","WAVE"
"UNITS","VPK"
"CHANNEL","A"
"SITE_ID","DRANETZ 658 Power Quality Analyzer"
0.0,14.000
138.9,22.000
277.8,30.000
416.7,37.500
555.6,45.000

694.4,52.000
833.3,59.500
972.2,66.500
1111.1,73.500
1250.0,80.500
1388.9,87.500
1527.8,94.500
1666.7,102.000
1805.6,109.000
1944.4,115.500
2083.3,122.000
2222.2,128.000
2361.1,133.500
2500.0,138.500
2638.9,143.500
2777.8,148.000
2916.7,151.500
3055.6,154.000
3194.4,156.500
3333.3,159.000
3472.2,161.000
3611.1,162.500
3750.0,164.000
3888.9,165.500
4027.8,166.500
4166.7,167.500
4305.6,168.500
4444.4,168.500
4583.3,169.000
4722.2,168.500
4861.1,167.500
5000.0,167.000
5138.9,165.000
5277.8,162.000
5416.7,158.500
5555.6,155.000
5694.4,150.500
5833.3,146.000
5972.2,141.500
6111.1,135.500
6250.0,129.000
6388.9,122.000
6527.8,114.000
6666.7,105.000
6805.6,96.000
6944.4,85.500
7083.3,74.000
7222.2,63.500
7361.1,53.500
7500.0,43.500
7638.9,33.500
7777.8,23.500
7916.7,14.000
8055.6,4.500
8194.4,-4.000
8333.3,-12.500
8472.2,-20.000

8611.1,-28.000
8750.0,-35.500
8888.9,-43.000
9027.8,-50.500
9166.7,-57.500
9305.6,-64.500
9444.4,-71.500
9583.3,-78.500
9722.2,-86.000
9861.1,-93.000
10000.0,-100.500
10138.9,-106.500
10277.8,-113.500
10416.7,-120.000
10555.6,-126.000
10694.4,-131.500
10833.3,-136.500
10972.2,-141.500
11111.1,-145.500
11250.0,-149.500
11388.9,-152.500
11527.8,-154.500
11666.7,-157.500
11805.6,-159.000
11944.4,-160.500
12083.3,-162.500
12222.2,-163.500
12361.1,-164.500
12500.0,-166.000
12638.9,-166.500
12777.8,-167.000
12916.7,-167.000
13055.6,-167.000
13194.4,-166.500
13333.3,-165.500
13472.2,-163.500
13611.1,-160.000
13750.0,-156.500
13888.9,-153.000
14027.8,-149.000
14166.7,-144.500
14305.6,-139.500
14444.4,-133.500
14583.3,-127.000
14722.2,-120.500
14861.1,-112.500
15000.0,-103.500
15138.9,-94.000
15277.8,-83.000
15416.7,-72.000
15555.6,-61.500
15694.4,-51.500
15833.3,-42.000
15972.2,-32.000
16111.1,-22.000

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